Popular Science

A PICTURESQUE VIKING SHIP MODEL
APRIL ANYONE CAN BUILD - PAGE 70 25 CENTS

BY AIRPLANE OR MULE-BACK

There's a maio station in Honducia, six thousand feet high, upon a mountain top. They use Radiotrons there, high power Radiotrons, for transmission. More than once in an emergency, the Radiotrons have had to be delivered by simplant. Usually they are carried up the rough mountainside by mule-back.

These great Radiotrons cost a few hundred dollats apiece, and as not many "spares" can be kept on hand at that price, each one must perform exactly to standard—each one must be stardy of build in spare of its delicate accuracy.

The laboratories that design these high power tennamusian tubes design the Radiotrons you use. The same factories make them. The same test laboratories test them. RCA produces the rubes for all sorts of high power transmission and learns from these tubes many a lesson of making and testing that gives you a better Radiotron for your receiving set! Benefit from this experience by using only genuine RCA Radiotrons, no matter what type of tube you use,



New York Cheage
Sep Propriets



Every tube in your set counts!

Every tube in your set has its "finger in the pie." The faint signal that comes in from the broadcasting station goes through each tube, and it's magnified hundreds of thousands of times before it gets to the loudspeaker.

It's not only important to get the "special" Radiotrons that give you bigger distance and bigger volume. But it's just as important to stick to genuine Radiotrons straight through the set, if you want to keep up its performance. RCA research makes Radiotrons better and better every year!



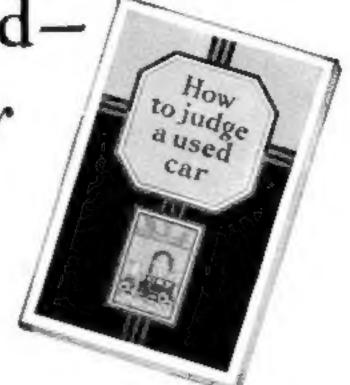
Bring your storage battery set ap-to-date with a power Kapothou CK 111 or CK 111 of CK

RCA Radiotron

MADE BY THE MAKERS OF THE RADIOLA

Before you buy a used car from a friend-

Send for THIS FREE BOOK!



Pledge to the Public on Used Car Sales

- 1 Everyused caris conspicuously marked with its price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.
- 2 All Studebaker automobiles which are sold as CERTIFIED CARS have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.
- 3 Every purchaser of a used car may drive it for five days, and then, if not satisfied for any reason, turn it back and apply the money paid as a credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)

To the Public: We pledge adherence to the above policy in selling used cars.

Your Stubbaker Dealer

Mail this coupon for your copy of "How to Judge a Used Car"



IF you were about to buy a used car from a friend, would you know how to determine its fair market price? Do you know why some dealers mark their prices in code instead of plain figures? Do you know how to tell what year any used car was built?

You will find the answer to these questions and many others that any buyer of a used car should know in this free book, "How to Judge a Used Car." It tells you what to look for and what to avoid in purchasing a used car. It is based on the long experience of experts in buying used cars for Studebaker dealers—their sound, practical advice may be the means of saving you time and money. Send for it at once!

Studebaker is only too glad to help you get the greatest value in a used car for your investment. Because Studebaker dealers believe in this policy, they have adopted this famous Pledge. Wherever you see this Pledge displayed you can buy a Certified Studebaker with absolute assurance that it is worth what the dealer asks and will do what he says.

Department D56.	Contraction or AMERICA South Bend, Indiana copy of valuable free booklet, "How to Judge a
Some	
Siner	
Terra.	Sir

Cay grant room

STUDEBAKER



THEN AND NOW

AN EDITORIAL

HE other evening I was talking with an old friend. Some twist in the conversation recalled our school days. We began to compare ourselves as we were then with our sons and daughters of today.

"What beats me," said my friend, "is that my youngsters really seem to enjoy going to school. Remember how we used to hate it? Remember how we'd rig up all kinds of excuses to stay home, from headaches to torn trousers? But now you can't keep children away from school.

"I wonder if it's because the folks who run the schools have learned how to dress those dry examples, rules and dates in an interesting way? We used to get our knowledge like parrots, without knowing what half of it was about. But now the kids seem to soak it up as easily as playing a game."

Then, a few days later, there came to my desk a letter from a new reader in San Jose, California.

"Popular Science Monthly is to me the most interesting magazine in the world," he wrote. "I can remember, not so long ago, when I shied at the very word science. To me, and to a lot of others, it suggested itl-smelling rooms, men with long beards and mouthfuls of meaningless terms. But you have changed all that for me, by telling the scientist's story in terms I could understand."

SCHOOLROOMS transformed from drab prisons of learning to fuscinating places of enjoyment! Science, dry and technical, made interesting, understandable—a living inspiring thing! The same basic idea, the same kind of purposeful effort brought about both of these changes. Month after month it is the effort of the editors of this magazine to strip away the dull cloak which once surrounded science and reveal its true charm and simplicity, its glamor, its romance and its enormous daily value to you and me. It is our purpose to make each issue better than the last."

And when, in last month's issue, we expanded our editorial plan to include fiction for the first time, we were interested to learn how our readers would greet the innovation. The response, as expressed in hundreds of enthusiastic letters already received, was beyond all expectations.

"GIVE us more stories like 'Midge,'" wrote one man from Ohio. "For the first time in my life I can experience the thrill of a big steel plant."

Another, a Texan, wrote: "If the next installment of Bare Hands is as absorbing as the first, we'll need a copy of the magazine for every member of the family."

Hundreds of other letters like these have justified our belief in this entirely new and different way of presenting the great drama of

If you did not read the first installment of Hawthome Daniel's new novel, you can begin it now on page 36. And you won't want to miss Captain Dingle's delightful short story, "Tishy," on page 14.

These, with many timely articles describing new achievements, discoveries and useful ideas, will, we believe, bring the whole tremendous story of science to you in a more enjoyable and worth while way than ever before.—E. C. W.

April, 1937, Vol. 110, No. 4. Popular Science Monable to published monthly at 250 Fourth Avenue, New York, N. Y., b) the Popular Science Publishing Co. Inc. Entered as second-rises matter Dec. 25, 1915, at the Post Office at New York under the act of March 3,1976; additional enter as second-chan matter at Chicago, Minesta Entered as second-chan matter at the Post Office Department, Canada Printed in U. S. A. Cupyright 1927, by the Popular Science Publishing Co., Inc. Single copy, 25 cents. Yearly subscriptions to Comed.

States, its peace-alone, and Canada, \$2.50 foreign opuntries, \$3. The tradects of this magnitude must not be reprinted without perposition. In presenting in its effected columns numerous stories of new products of applied science. Papular Science Monthly does not underwrite the business methods of the individuals or concerns producing them. The use of Popular Science Monthly articles for an extending schemes is never an bordsed. O. H. Capen, President and Tremszer H. C. Wusun, Vice-President, A. L. Cale, Serretary

Silent, permanent radio power from the light socket



with Balkite"B" and the new Balkite Trickle and High-rate Charger



Balkite Trickle Charger \$10

For those who require a charger of limited capacity only. Over 350,000 in use. Charging rate 5 ampere. Price \$10. West of Rock-les \$10.50. (In Canada \$15.)



Balkite Combination

When connected to your "A" bettery supplies automatic power to both "A" and "B" circuits. Controlled by the filament switch already on your set. Entirely automatic in operation. Serves any set now using either 4 or 6-volt "A" batteries and requiring nor more than 30 milliamperes at 135 volts of "B" current—practically all sets of up to 8 rubes. Price \$59.50. (In Canada \$83.)

All Balkite Radio Power Units operate from 110-120 volts AC current with models for both 60 and 50 cycles. The new Balkite Charger is also made in a special model for 25-40 cycles. Over 1,000,000 radio set owners are now using Balkite Radio Power Units because they provide silent, permanent power from the light socket. They are noiseless in operation and can be used during reception. They employ no tubes. They have nothing to wear out or replace. They are built to conform with the Underwriter's standards. Other than a dight current consumption their first cost is the last. Permanent and unfailing in operation, they are based on the same Balkite principle now commonly used in railway signaling, hospital lighting, and numerous other systems where power must be infallible.

One way of equipping your radio set with Balkite is to merely add Balkite "B" and the Balkite Trickle and High-Rate Charger. Baikite "B" eliminates "B" batteries entirely and supplies "B" current from the light socket. It is the proved popular "B" power supply. Of the 150,000 now giving satisfactory service, some of which have been in use for over three years, to our knowledge not

one has ever worn out. The new Balkite "B"-W serves sets of 5 tubes or less requiring 67 to 90 volts, Balkite "B"-X (shown above) sets of up to 135 volts and 8 tubes and Balkite "B"-Y any standard set. Most owners of even small sets will buy Balkite "B"-X which will take care of nearly any set you may buy in future.

The new Balkite Charger with both high and low charging rates is easily the greatest charger value in radio. It combines the advantages of both trickle and rapid charging. At the low rate, on trickle charge, it automatically keeps your "A" battery fully charged, and in effect converts it into a light socket "A" power supply. Its high rate provides an ample reserve of power for the largest sets.

Add these Balkite Units to your radio set. Then you will enjoy the last word in radio convenience, and silent, unfailing power from the light socket. Ask your dealer. Fansteal Products Co., Inc., North Chicago, Illinois.

Builtite "B"-W \$27.50; "B"-X \$42; "B"-Y \$69; Builtite Charger \$19.50; West of Rockier \$20; (In Canada "B"-W \$39; "B"-X \$59.50; "B"-Y \$96; Charger \$27.50.)

> Balkite Radio Power Units

0

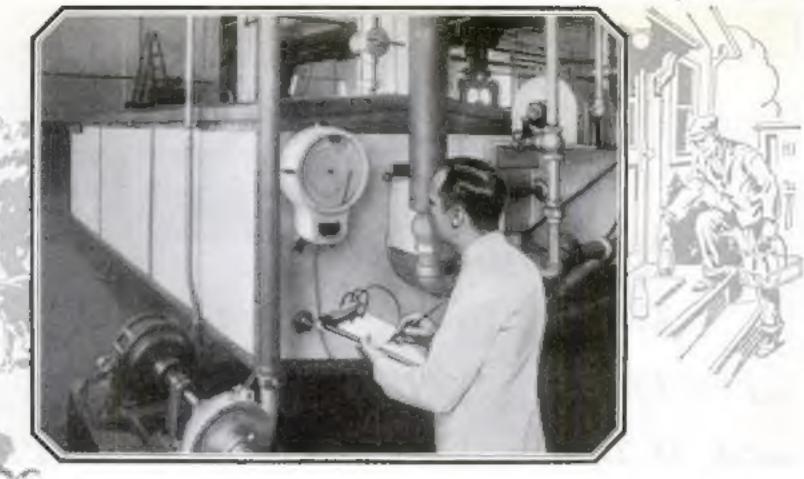
Copyrighted Intalesal

THE REPORT THE OF SPECIMENTANC REALISM IS LABORATOR BY

EDBAN W. SMELE W. S. SEMBLE PAYERS NO. 19,454, DATES SCY. 12, 1650







The health of Millions is protected. by Tycos - the Sixth Sense

O KILL any communicable disease germs which may be in the raw milk as it comes from the farm, milk is pasteurized. Two Instruments are an important factor in pasteurization—and pasteurization protects the health of millions.

The largest creamery in Detroit uses 30 Feor Temperature Recorders and 15 Foor Temperature Regulators to insure the proper pasteurization of their milk. One of the largest dairies in Cleveland says they are saving \$4,800 a year through the installation of Secor Recording and Regulating Instruments. In this plant Trees Instruments are paying for themselves every two months. And in addition they are making big savings in preventing spoilage.

Tycos Instruments for indicating, recording and controlling temperature are the Sixth Sense of Industry. They are saving labor costs, eliminating loss through spoilage and insuring uniformity of production in all branches of industry where the indicating, recording or controlling of heat is required.

Whether you make steel or bread, furniture, ice cream, tools, candy, or any other product that goes through manufacturing processes that require the indicating, recording or controlling of temperature, there is a type and style of instrument in the Tyear line of 8000 varieties that will help you. Informative literature on any type of instrument will be sent you promptly on request. Or our engineer will consult with you on the application of Free to your particular manufacturing problem.

Taylor Instrument Companies

Main Office and Factors ROCHESTER, N. Y. . U.S.A.

Tycos for the Home

Sum Office Thermometers
An old in promoting human efficiency.

Toron Both Thermometers

To enable you to get the most good from your both.

Wide Home Set

Sake Oven Thermometer, Candy Thermometer, Sugar Motor. The searce of accusate results in Cooking.

Treas Wall Thermometers

To help you the plant a compension in your house

conductive to good basich.

Their Quality Companies To show you the right way in unfamiliar country.

Total Fever Thermameters

A passenty in every bosse,

Treco Steenwaguide

Porecasts the weather twenty-four hours shaud with dependable activities.

Hone Hygrameter To enable you to keep the butteldity of the attent-

Tycos for the Medical Profession

Fiere Sphygmousenometer, Pocket and Office types.

From Unnalyse Glassware.

Secre Fever Thermanneters.

Your dealer will show them to you. Ask us, an a postal, for booklets on any of the above



Copyrighted minimity.

THE ~ SIXTH ~ SENSE ~ Vocating · Recording · Controlling

This One LF01-SRG-BLD1

Do you dream of Independence for them?

HOW much more rich will life be if you realize that each day is leading you towards a certain financial independence amid ideal working and living conditions? How much better for them! Talk over with your wife the new plan which the financially

powerful Brotherhood of Locomotive Engineers has worked out at Venice, Florida, to supply a basis of future independence for people who will operate business farms on soil of high fertility, backed by

the experience and advice of the Venice Farm Board.

The Brotherhood, with sixty-three years of experience devoted to the improvement of living and working conditions, has made arrangements so that earnest people of moderate means can purchase Venice Farms on liberal terms—fronting on good roads cleared and ready to plant, with main drainage available.

Here the Farm Board operates Demonstration Farms, the Venice Nursery, and the Venice Dairy Farms, the facilities of which are

available to Venice Business Farmers.

People are coming here who never dreamed of farming before. It is business farming-entirely different from the old-fashioned drudgery so long associated with farm life. Here nature lends a helping hand, crops grow bountifully and fast, and bring highest prices in early winter markets.

Here is year around out-door life under an ever-

shining, life-giving sun. Every farm is in easy driving distance of the new model city of Venice. In this community an ideal life and real independence is possible. There is the confidence given by the Brotherhood's financial strength, prac-

tical help by men who know Florida farming, the companionship of people who have already embraced the opportunity and are on the ground, and finally nature's own best co-operation.

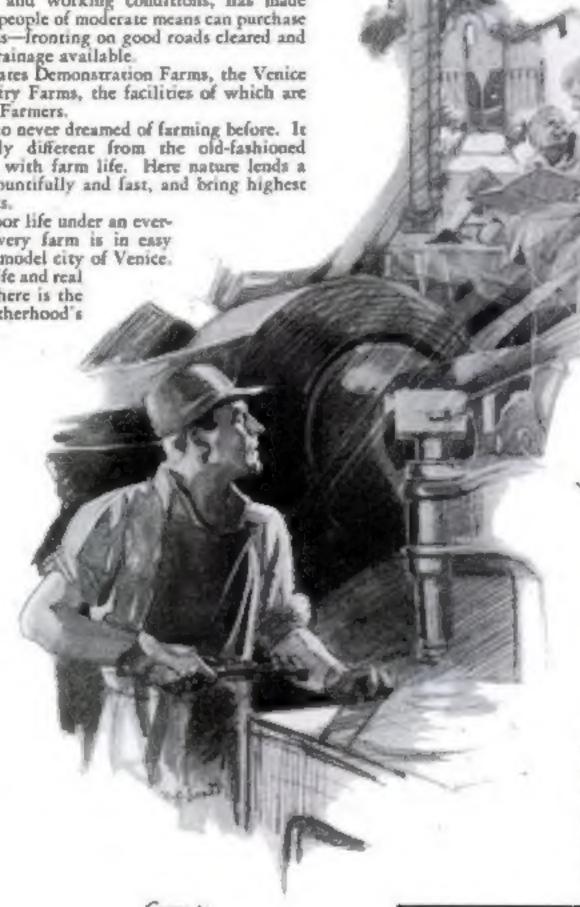
Venice a natural all-year resort

Venice life is divided between agriculture, industry and resort activities. Vacationists remark the variety of diversions. Here one finds the West Coast's only mainland beach and its most famous fishing grounds Here is a modern city planned and built by experts which fromts on the beach. Adjacent to it is what visitors call the largest and most comprehensive farm development ever projected in America . . . Venice hotels serve fruit, vegetables, milk and cream received fresh every day from Venice Farms near-by. Convensently located are well-kept golf courses, tennis courts, quoits and other games, and excellent hunting and fishing are found to the tropical Myakka River and its valley. Hotel rates from \$1.00 to \$25,00, with 60% of rooms at \$1 00.

THE VENICE COMPANY Gwned by The Brotherhood of Lecemetire Engineers

We limit this salverthing to de . protectable facts supplied by the Venice Farm Board and officials to charge al the City of Venice A

THEN LIVE THIS NEW LIFE



Mail this coupon for the Blustrated Booklet containing information and photographs sup-plied by the Venice Farm Board, and Resort Officials, describing the opportunity to lead a new free life under ideal conditions at Venice on the Gulf.

Come to National Tarpon Tournament at Venice June 4th to 25th

THE VENICE COMPANY

123 Venice Boulevard, Venice, Florida

Please send me the busides, mecaning information and photographs applied by the Venice Form Roard and Resert Oficials, describing "A New Life of Independence" possible union the pleasure conditions as Venice.

100	-88			
- 25	w.	a		
		_	_	

Address

Present Openhation

A BUDGET PLAN That Will Help You Get Ahead

By WALLACE AMES, Financial Editor

ON'T talk to me about budgers," expostulated Ted Carter. "We've tried them all, and all we have to show is a lot of loose leaf books, special forms and cash accounts which never would balance. Why, we set out the first of this year dead-set on making a budget work and already it is way out of joint.

The bond talesman was undiscouraged. He had been up against just this situation before. "I know the answer to your problem," he said, "and right now I am more interested in helping you to work out a successful budgering plan than I am in selling you a bond. If you adopt the plan I want to show you, you will be able to buy bonds regularly."

"All right, let's have it," consented

Carter, still unconvinced.

"To begin with," continued the bond man, "the trouble with all the budget plans you have tried is that they involve too much pesky detail. They do not take into consideration that you and your wife are two individuals, with ordinary human weaknesses, not a strict business concern with its systems and rigid rules. You get tired of keeping a cash account of pennies spent for newspapers; you lose interest when something unexpected comes up and, 'throws your budget out of joint.

"Probably you have tried a number of ser budget forms, standardized systems which you got in some store. These 'ready-made' systems allow a certain percentage of your income for this, a certain percentage for that, but their allowances don't fit your You have been trying to squeeze your personal financial budget into a 'ready-made' plan and it doesn't work any more than a square

peg fits in a round hole.

"IN THE first place, I want to show you how to design a budget plan to order, adjust and suit it to your circumstances.

"In the second place, I think I can with a lot less bookkeeping than you have been bothered with in the past. Of course you will have to keep some accounts, but the amount of them can

be greatly reduced and simplified so that they will not be tiresome. And the result-your gain in satisfaction as well as in cash conserved—will be

a rich reward.

"What is a budget, anyway?" asked the bond man, and then proceeded to answer the question himself. "It is a division or apportionment of your income so that you are spending the proper amount on various things. It is the one way to keep you out of financial holes. It is the only way you can be sure of having money for the things you need -when you need them.

"TET US begin, then, in your 'made-Lo to-order budget, by separating into two classes your Fixed Charges and your Fluctuating Charges. Your fixed charges consist of definite or easily controlled items such as rent, taxes, insurance premiums, savings, etc. Fluctuating charges consist of items which are subject to wide variations, such as clothes, provisions, entertaining, medical aid, etc.

"After your fixed charges are determined and provided for, you can practically forget them and concentrate on controlling the fluctuating charges, where the leaks are most likely to occur. This plan will also reduce the amount of account keeping

you will have to do."

Then the bond salesman took out a paper on which he had written a general analysis of fixed and fluctuating charges. He gave this to Mr. Carter to use as a guide only. It was up to Carter to figure out what his own fixed and fluctuating charges were and what amount of his total income to reserve for each one. The general analysis on the memorandum paper was as follows:

FIXED CHARGES

A. Accommunities: Savings; investment; building and loan shares; payments on mortgage; life

House Rent; interest on mortgage; property

taxes; fire insurance.

show you how to operate a budget C. Operation los; gas; electricity; coal; relephone; servants; laundry; clothes tepair. D. Automobile: Garage rent; insurance; payments on note; licenses.

E. Spezial: Allowances to dependences, personal taxes; dues; charity; education; vacation.

FLUCTUATING CHARGES

A. Find: Provinces; meals eaten out.

B. Auto Maratementer Gasoline and oil; repairs and adjustinents; accessories.

C. Disertion: Recreation; entertaining; exercise; books and magazines; hobbies, such as camera or radio or workshop.

D. Contingencies: Household supplies; new furniture, bouse and bousehold repairs; doctor, dentist and nurse; drugs, etc. E. Personal: Clothen; gifts; tohacco; candy;

cash for miscellaneous items such as carfare, F. Spenal: To provide against necessary ex-

penditures in excess of the regular budget allowance a small amount should be reserved to add an necessary to any of the catablished charges.

"Now," resumed the bond man, after they had looked over the memorandum, "let me make a few suggestions as to how to put your 'madeto-order budget into operation.

"Tackle the fixed charges first. Make a memorandum on one page of the amount you need to put in the bank every week or month so that you will have enough money to meet these fixed charges when the bills come in. You can then determine how much of every pay check you will have to deposit to take care of fixed charges. There is no further account keeping on these. Your check book stubs are all you need.

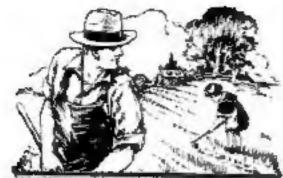
"TOTAL up the amount of all A fixed charges and subtract it from your gross income. The remainder you have to divide over fluctuating charges. Make a memorandum of these on another page.

"The only cash account you or your wife will have to keep is one of money spent on the fluctuating charges. And you both will have to train yearselves to keep your fluctuating expenses within the amount allotted.

"Get an ordinary memorandum book. Start a page for your current expenditures of each item in your fluctuating charges. Keep track of money spent and see that you do not

go over your allotment.

Most of us find that operating a budget is such a nuisance that good resolutions to do it are often broken. Yet, living on a budget basis is extremely important in the business of getting ahead, and the Simplified Budget Plan outlined in this arricle will help you.



Judgment

When you till the soil you put your trust in nature. But you use judgment, also, in the planting.

In much the same way, investing calls for confidence in others. But judgment should guide you to the proper institution—one of proved experience, integrity and conservatism,

As you consider Fidelity Guaranteed First Mortgage Bonds, at 612%, we urge you to confirm their safety by investigating the Company that sponsors them. Our booklet, "The House Behind the Bonds," will aid you. Send for it, without obligation.

4 I I I) 3 I II BOND MORTGAGE CO.

600 Chamical Bldg., St. Louis 1188 New York Lafe Bldg., Chicago 57% Colorado Nat'l Bank Bidg. Denver

(FIDELITY-GUARANTEES-EVERY-BOND)

A Service for Readers

THIS Financial Department is to help readers in the establishment of proper financial programs at the beginning of their business careers, it assists those who have accumulated money in the proper investment of it so that it will be rafe and so that it will grow.

The Editor of this Department is an authority on investment mattersand he will not only every month give the readers interesting and useful information in his articles, but is also ready to aid in personal investment problems. Advice will be gladly given regarding the proper investment of funds and proper plans of saving.

Address all your inquiries to Wallace Ames, Financial Editor, POPULAR SCIENCE MONTHLY. 250 Fourth Avenue, New York.

Any advertising appearing in this section will be vestigated by the Publisher of POPULAR SCIENCE MONTHLY. Readers can be sure that companies advertising are reliable and that they offer securities which represent sound feancial investments. While investments obviously cannot be guaranteed by the Publisher, every effort will be made to insure that only advertisements of absolutely reliable companies are accepted.

Booklets that Will Help You Get Ahead

ANYONE with money available for A investments will find the booklets listed below of help in getting ahead financially. You may obtain any of these booklets by writing direct to the issuing house. It will be appreciated if you mention Popular Science. MONTHLY when writing for booklets.

How to Build an Independent Income (1917 Edition)—Describes a plan for buying 652%. First Moregage Bonds by payments of \$100 or more a month, and shows the results that may be accomplished by systematic investment. at 61/4%. For copies address: The F. H. Smith Company, Smith Building, Weshington, D. C. Ask for Booklet 75:

Why Your Real Estate Bonda Should Be Guaranteed is the self-explanatory title of a knoklee on a subject of wide interest among investors in Real Estate bonds. Address: Adair Realty & Trust Co., Healey Building, Atlanta, Ga. Ask for Booklet P. S.-s.

Forty-four Years Without Loss to Any Investor presents the safety record of this house and describes the safeguards constituting the Straus Plan. Address: S. W. Straus & Co., Desk P, Fifth Avenue & 46th Street, New York,

The Strength of the Utilities, with illustrations, charts and layman's language, presents facts that every investor should know regarding the public utility industry. Address: Halsey, Stuart & Co., 201 So. La Salle St., Chicago, Ill. Ask for Booklet P. S.-S. U.

The Making of a Good Investment explains the methods employed by the United States Mortgage Bond Co. in originating first mortgage bond issues which pay 6% with principal and interest guaranteed, or 616% without the guarantee, which is optional with the investor. Address United States Mortgage Bond Conpany, 365 U. S. Mortgage Bldg., Detroit, Mich.

An Investment Insured for Its Lifetime describes a plan of insured mortgage investments. Nine points of safety are explained. Address: Mortgage Security Company of America, Norfolk, Va.

Rules for Safe Investments explains in language that the layman can understand the important factors of safety of real estate bonds. Address: American Bond & Mortgage Company, 345 Madeson Avenue, New York, N. Y., and ask for Booklet P. S .- so.

Buying Bonda by Mail captains how the investor may safely and conveniently deal with an investment banker through the mails, and without the usual advantage of direct contact, Address: A. C. Allyn & Co., 67 West Monroc Street, Chicago, Ill. Ask for Booklet D. E .-

Your Money covers the points of general interest to the investor who is planning to put his money in sound mortgage bond investments. Address: Fidelity Bond & Mortgage Co., 1188 New York Life Bldg., Chicago, III.

Investment Service explains the service given by a first moregage bond house. Address: Federal Bond & Moregage Co., 1444 Grawold Street, Detroit, Mich.

The Science of Fortune Building, published by George M. Forman A Co., is the explanation of practical, rested plans employed by investors to attain financial independence. Address: George M. Forman & Co., 164 West Monroe St., Chicago, Ill. Ask for Booklet 833.

Investors' Guide, published by Greenchusm Sous Investment Company, combines a description of "bank safeguarded" bonds with an outline of the service of that company. Address Greenebaum Sons Investment Co., 9 So. LaSalle St., Chicago, Itl.

You, too, can build an INDEPENDENT INCOME

with

lonay, when means are provided for thrifty men and women to invest their savings in sound securities, the way to financial success is open, and the rules are simple and few:

- I Set aside a part of each month's income as capital;
- 2 Invest that capital in good bunds to produce more income:
- 3 Insist upon safety.

The longer you follow this method, the faster your money grows; for, obviously, the more income you receive the more bonds you can buy, and the more bonds you buy the more income you receive. As to the third rule, by insisting upon safety you make sure that you will hold all of your gains.

SMITH BONDS combine the interest rate of 61/2% with the accurity of first mortgages on modern, incomeproducing city property, and with safeguards that have resulted in our record of

No Loss to Any Investor in 54 Years

As a result of this record, confidence in Secret Boxps is world-wide. Meg. and women in 48 States and in 51 countries and territories abroad have bought Swith Bonds by mail.

You may buy Smith Bonds in \$1,000, \$500 and \$100 denominations, outright for cash, or under an Investment Savings Plan that pays the full rate of bond interest-61/2% -on regular monthly payments of \$10, \$20, \$30, \$40, \$50 or more.

Mail the form below for our booklets, "Fifty-Four Years of Proven Safety" and "How to Build an Independent Income."

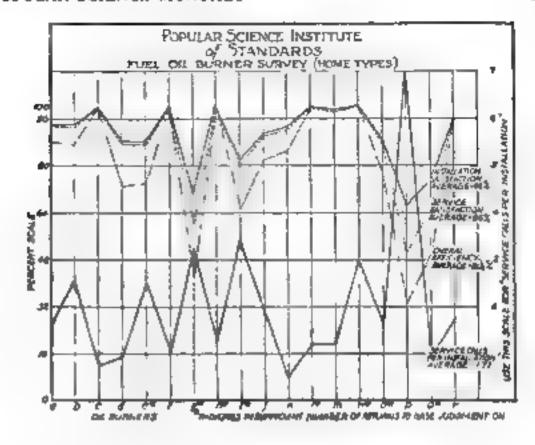
SMITH BLDG., WASHINGTON, D. C. 285 MADISON AVE., NEW YORK, N.Y.

CHICADO	THIS APPELYRIA	80370%	PETTANDEN
ar. americ	BUFFALO	SENSEAPOLIS	ALSANT

to and a second		 116
A48111	0.000.000.000.000.000	

This graph shows the very debatte type of information the Popular Science Institute has on on burners as a result of its investigations among 3,000 oil burner owners.

Do You Know



How to Pick a Good Oil Burner?

MAN who recently had an oil burner installed in his home was telling how he went about selecting it. I marveled at the haphazard, even careless, way he had made his choice and yet I knew him to be a shrewd and careful buyer of other things that cost a fraction of the price of an oil burner

In buying an overcoat, a piece of jewelry, or even a pipe, I know perfectly well that this acquaintance of mine would never have been willing to make his selection on the basis of what information he had gathered from a friend or two, or some salesmen. He would have judged for himself, or else made inquiries of someone better informed and entirely impartial

But in buying an oil burner, he had been up against a different proposition. Here he was investing several hundred dollars and yet had no gage of past experience or source of expert advice to aid him in his purchase. So this major investment was made on a guess, a lucky one, fortunately. He selected (or, rather, blindfoldedly drew) a burner which our Popular Science Institute of Standards has found to be one of the very best, after thoroughly investigating some three thousand installations of oil burners.

Guesswork, as most people realize, is not a safe way to go about selecting anything. Now that the Popular Science Institute has extended its activities to include the investigation of oil burners, you can buy these marvelous new labor savers without resorting to guesswork. Already, twelve hundred readers of Populan Science Monthly have come to us for advice in installing oil burners in their homes.

By PROF. COLLERS P. BLISS, Director Popular Science Institute of Standards

They have reasoned that it is considerably safer to go by the experience of three thousand people than that of the few oil burner users among their acquired.

In investigating these three thousand installations, the Popular Science Institute of Standards has not confined its search to any one city or section of the country. A comprehensive and fair picture of just what degree of satisfaction oil burners are giving, and which of those on the market are good, was gained by covering installations in small towns and cities scattered all over the country from Maine to California.

We asked these oil burner owners how long they had had their burner installed, how many service calls had been required, what kind of service they received, whether their burner was costing them more or less than using coal as a fuel, how much more they would be willing to pay for oil before they would go back to burning coal, whether there was a disturbing noise from the burner and, finally, were they tatisfied with the burner as a whole. When we got through asking all three thousand owners these questions, we were able to judge just which burners could be purchased with the positive assurance they would give satisfaction

A very careful tabulation was made of the results of our survey, giving us definite figures as to the findings regarding the different burners investigated. The over-all efficiency of the burners was calculated in percentages in each case. We established a certain high percentage as "passing," and those burners which rated this percentage, or higher, have been approved by the Popular Science Institute of Standards. The only burners engible to our approval for efficiency are those that have the Underwriters' Laboratomes' approval as to freedom from fire hazard

In writing to the Popular Science lostitute for recommendations of oil burners, he sure to give us information on the following points

1 Number of rooms in the house (baths and small halls not included),

Type of heating system used
 Average coal consumption per year

4 Whether there is gas or electricity in house.

Address letters to the Popular Science Institute of Standards, 250 Fourth Avenue, New York City.

Popular Science Monthly GUARANTEE

The above scal on an advertisement indicates that the products referred to have been approved after test by the Popular Science Institute of Standards.

Portilat Settings Montaint guarantees every article of merchandine advertised in its columns. Readers who buy produces advertised in Portilat Science Montaint may expect them to give absolute satisfaction under normal and proper use. Our readers in buying these products are guaranteed this satisfaction by Portilat Science Montains

THE PUBLISHERS

"— remarkably good/"



ALL-AMERICAN

Battery Eliminator

That is the judgment, without exception, of radio experts and enthusiasts who have examined and tested these two fine units.

They mean better reception. Both have a great deal to do with finer tone-quality. You owe it to your own enjoyment of radio, to know the facts about these fine-quality accessories.

All-American Reproducer

For purity of tone this handsome product is outstanding among reproducers. It combines angeniously all advantages of good cone-type reproducers—and the improved quality provided by a special tounding board and sounding chamber. A highly sensitive unit which reproduces voice and instruments naturally and clearly. Perfect uniformity is maintained over the entire musical range, whether amplifiers are turned to full volume, or down to a whisper. Absolute freedom from "inherent pitch" prevents low throaty tones or twangy nasal effects.

Price \$25.00

Provenue absolute tacher

All-American Constant-B

An attractive compact unit of silent efficiency—insures a dependable supply of uniform plate current. Five output taps, negative, +45, +67, +90, and a power tube tap adapt "Constant B" to all requirements. A "Detector" control provides voltage variation between 10 to 60 volta. An "Amplifier" control allows a variation of 10 to 120 volts on the intermediate tap, without affecting the 90 volts supplied to first audio stage. A High-low switch adapts "Constant B" to receivers of various current requirements.

Price \$37.50 Complete with Raythron Tube

New 1927 Radio Key Book

Learn more about the fundamentals of radio. This new 48-page book contains an interesting analysis of radio in language anyone can understand—also complete constructional details of the leading types of circuits. Sent for 100 (coin or stamps) to pay for postage and mailing.

ALL-AMERICAN RADIO CORPORATION

4205 Belmont Avenue, Chicago, Illinois

OWNING AND OPERATING STATION WENR 4 266 METERS



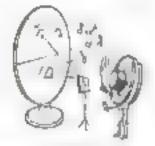
Ats Flexible One Dial Control

is but one of seven reasons why you'll want a Grebe

WITH its Flexible Unit Control the Grebe Synchrophase Radio becomes a one-dial control set-a great convenience for tuning local stations—with the added advantage of individual dial setting whenever desired.

> Booklet P tells about all seven advantages of the Synchrophase. Send for it.

A. H. Grebe & Co., Inc., 109 W. 57th St., N. Y. C. Pactory Richmond Hill, N. Y. Western Branch: 443 Sc. San Pedro St., Los Angeles, Calif. The aldest engineer sades manufactures



Given you control of the pitch and timbre of the load apeaker's voice eleminating the hamb, unnesural sounds which spoil reception.







POPULAR SCIENCE MONTHLY

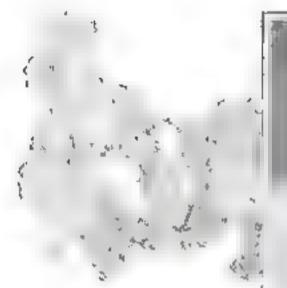
SUMNER N. BLOSSOM, Editor April, 1927



A Job for One in a Million!

Why Only a Few Men Can Photograph Cities, Chart Forests, Explore Jungles from Aircraft

By H. A. BRUNO



IX thousand feet above the town of Corners. lows, two veterin sirmen swept across the blue sky in an old war-time De Haviland plane, making a photographic air map of the countryide below. At the controls sat Harlan Guerney. ex-war p lot, intent on battling a stubborg wind that tried to thrust his machine from the course charted on a survey map before hon. In the rear rockpit A. O. Russe I, photographer, bent over the adjustments of a large camera, whose searching eye protraden downward through a hote in the

The camera was clicking off its exposures with monotonous regularity when middenly, with a dealening blast, the mg 400-horsepower motor backfired, igniting the gua-filled carburetor. Instantly the plane, and the men who rode it, were enveloped in flames.

Guerney turned for one gram glance at his companion; then, with the instinct born of experience over the battle lines. he threw the plane into a sideshp. It was the one desperate chance, he knew, to blow the flame to the side and away from their faces.

Downward they plunged, a ghastly



A camera eaglet. Lieut. W. L. Richardson, chief photographer of the Bureau of Aeronautics, U.S. Navy descending into the power can of the dumphic Los Angeles from which he has taken many terms table photographs, including those of the ester eclipse of January 1925. He took the eclipse pictures at an altitude of 0.000. feet, alonely perched with his camers on top of the everying disigible!

> torch from the heavens. Russell braced himself for the crash, Just when death loomed as inevitable, Guerney, in a last frantic effort, with his face already blistered by the terrific heat, flattened the plane out of its adeslip in time to make a landing in a clear field. The fiery thing hounced wildly along the ground, and as it. came to a stop the pilot dove beadlong through the flames and over the side. Scrambling to his feet, he looked for his comrade. What he saw was Russell struggling over the edge of the cockpit, his precious camera clutched tightly

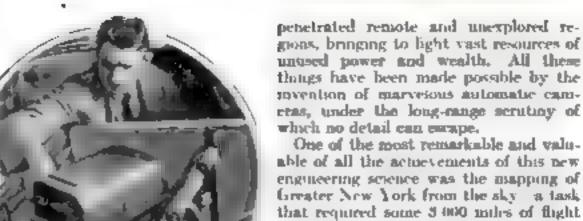
in his arms! A few mannents later the machine was a moldering skeleton.

But the next day they were back on the same job in another plane. That is the way of the serial photographer and the photographic pilot, a le partuers in a remarkable new profession which is blaxmg trads, for the progress of nd stry and docovery. That thrilling episode of last Armistice Day amply typifics the unbeatable spirit, get and skill of men who today are following the adventurous footsteps of pioneer surveyors of the past who planged with rod and transit into unknown spaces, charted wildernesses.

and wrote new frontiers on the maps,

"TEN years ago the scrence of aerial A photography was virtually unknown beyond the battle bors of the war, where it played a vital role. Yet even then there were young Americana who, looking mio the future, saw a great opportunity for peace-time use of pictures from the sky They visioned themselvet souring high among the clouds and, with eagle eye, surveying the face of the earth far below; mapping its mountains and streams, its crowded centers of industry.

and embraced a territory of 6%5 square



miles. In all, 2,000 arparute exposures were required to include the city s five bosonghs. But when matched together to form a map, true to scale, the photographs portrayed in minute detail every building, thoroughface nook and corner of the great metropolis; even hurrying crowds and traffic congestion were plainly visible,

> But of all the exploits of flying surveyors, few luve surpassed the more recent adventures of the little group of Navy pilots and camera men who, under the command of Lieut Ben H Wyatt I S. N. flew last summer over un-

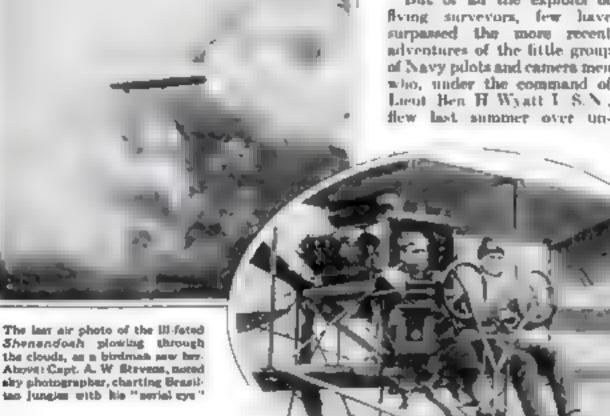
ers, establishing supply bases first at Actchikan, then at Juneau, Wrangell and Petersburg, ventured in two camera planes out over unpenetrated forests and rugged mountain ranges, leaving behind them one emergency plane to take up the search should one of them fail to return on schedule. Clumbing to a beight of more than two males above sea level, they skimmed over mow capped peaks, or looked down from giddy heights into deep wooded valleys. And always as they flew they were face to face with penl. Anywhere in that wild, manhabited land engine failure and a forced failding meant

And yet they carried on the survey with incredible speed. Equipped with tilgenings three-less cameras capable of making three exposures amultaneously, and flying at a speed of a hundred todes an hour, they were able in one hour to map a strip seven miles wide and one hundred miles long, or 700 square miles, On the average they surveyed a thousand square notes a day. In 385 flying hours they traveled more than 85,000 miles!

"HEY discovered, incidentally, hun- dreds of new lakes and givers, many of them potential nources of numerous power to turn the wheels of industry in the Far North. They found inchois of acres of priceless timber. And they explored treacherous rivers that have run

> rich with gold, and ancient glaziem reaching icy eapst thousands of feet ir to the sky.

> When at last they returned from their hazardous venture, with every plane intact, they brought back not only n remarkable pictorial record of discovery, but proof of the practicularity of acceptt for the most difficult kind of surveying and exploration.



Today scores of these eagle then are flying over the countrysode with their remarkable

camerus; some of them so high that wine they can peer down through lenses and make visible, permanent recneds of your bouse and lot, office or factory, they are completely lost to your sight from below! Braving all weather, risking the bumping of winged ships in tricky air currents, trusting their lives to the smooth running of machinery, often facing the peril of a forced landing in the wilds, they are performing a service of ever-meressing value.

BY MAPPING entire cities from the solutions to difficult problems of traffic and city planning. In the rôle of tunber crusers, they have surveyed and mapped thousands of aquare miles of forest lands, not only charting the locations of varieties of timber, but making possible an netual count of the standing trees.

They have aided in planning great industrial plants; laid down the right-ofways for power lines, charted fire hazards, solved the tangle of rasiway terminals, charted golf courses, promoted real estate development. And finally, they have

Bide partners from the begu-Bung -corners man and paint, braving the beauth of the air with 1914 style plane

explored and forbidding fustnesses Alaska, completing in three months a survey of Uncle Sam's last frontier that otherwise might have required len years of struggle through all lost unpassable wilderness. achievement followed closely upon that of Capt. George H. Wilkins, the Polar explorer, to whom belongs the credit of taking the first aerual photographs far up in the Arctic Circle.

To the blinking eye of the camera, automatically recording all it saw, Alaska's nch storehouses gave up new secrets. The Navy fli-



Mapping New York from the sky-pleend together, the 2,000 exposures made portrayed every building in the metropolis

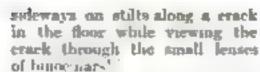
Aerial photography is no one-man game. It is an extremely exacting business which calls for perfect teamwork between pilot and camera man. They share adventures and dangers together. They must combine contrage and resource-fulness with quick wit and scientific accuracy.

If you could travel with them on one of their mapping trips, you would realize quickly why these qualities are needed. The pilot must guide his plane back and forth along maginary parallel lines or "strips used the entire area to be surveyed has been plategraphed to be fires, a long roll of photographs: film passes automatically tarough the camera and an exposed automatically ut regulated intervals, producing a succession of plategraphs. The procedure, in effect is the reverse of that for a motion picture the camera moves, while the objects are stationary

SINCE all the photographs obtaonly nest se to the same scale the first pole of the pilot is to keep his slop always at the same attitude—no mean task when you consider that the air in full of invisible bumps and pockets. Moreover, to keep to his maignary line, he must make allowances for aide drift in a cross wind, sometimes he must "crait" along his magnery guide line with the piane political in an entirely different direction. Add to that the jobs of constantly checking his aistrument dish and gages, guard-

ing against rocking and pitching, maintaining a constant speed, and at the same time cracing os neck over the cockpit to get his bearings, and you'll see that almost any other kind of driving it child's play in comparison. As one photo pilot expressed it:

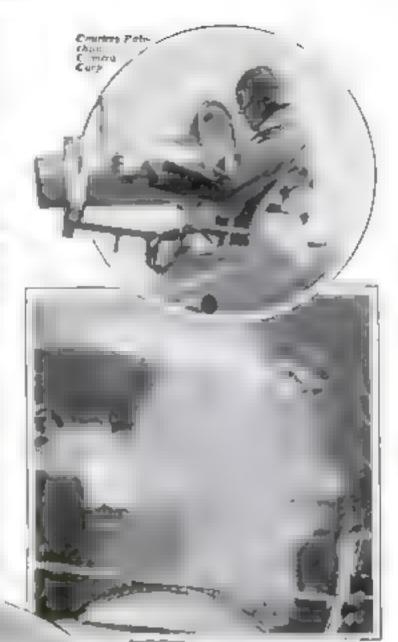
"If you really want to know what it's ake. Ity walking



Small wonder experts say that only four or five out of every hundred trained airmen can become photographic phots.

A D the camera man is much the same sort of busy cool-headed individual. His chief concern is to time the consecutive exposures of the film in accordance with the speed of the plane, and in such a way that they, shall overlap each other like shingles, so that not a sugge spot in the area under survey will be mass up when the photographs are fitted together in the mosaic map. Also, he thust continually adjust his camera to make up for any deviation of the plane from its course.

In the routine of their work the aeral map makers have come upon more than one astonishing discovery. A short time ago, for example, photographers flying on a survey over Connecticut succeeded in lowering the tax rate in five towns by discovering and locating "lost property" which



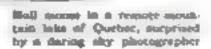
Remarkable photograph of Nagare Falls, allowing the American and Canadian falls and Buspension Bridge, taken by Major Hamilton Muswell. Upper photo "Shorting at long range with one of the marvelous new serial cameras.

City photographers han occasion to fly above the Hindson over. Later when the photographs were developed, one of these doclosed two actionarries lying beneath the

waters of the river

Quek communication with naval authorities estudished the fact that none of Uncle Sames submarances was operating in that vicitally. And, since it was peace time, there was no cause to suspect an enemy invasion, Naval officers who studied the photographs, however, were positive that the forms which the photographic revealed were quidersen craft. How they got there or what their mission might be, no one could guest. The only possible answer seemed to be that the submarines were rum-runners' craft. Covernment rum chasers sped up the Hadson to mvestigate, but when they reached the spot indicated on the photograph, the undersea forms had vanished without a

NEARLY every sky photographer could tell you of hair-raising experiences through which be has passed, R. A. Smith, a veteran at the game, has had more than his share of narrow escapes, Two years ago, for instance, while mapping a drawage district in Florida, he and his pilot, E. P. Lott, were forced down by a page 193,



had escaped the tax as-

sessor's list. When the pho-

tographs were developed, they deckeed landreds of

houses, barns and other

buildings on which iso



Indian encampment in Brazilian rangle, never before seen by white man and discovered by the all-seeing camera's eye

taxes had been levied. In one town, the aerial survey revealed 1896 buildings, including 248 stores on the main street, which had gone tax free, with the result that the camera men were instrumental not on vincutting the taxes of individual residents, but in adding millions of dollars to the public treasury.

Another strange discovery made some time ago during an aerial survey.

Another strange discovery under some time ago during an aerial survey remains an unsolved mystery. On a map-making trip north of New York.

TISHY

Because they tagged him with that name, he made a tragic blunder—How he redeemed himself nobly in the hiss of icy seas

By CAPTAIN DINGLE

Illustrated by Anton Otto Fischer



Tishy knew where to go. Houg in the lee of the engine room casing be found two deck chairs side by side. The girls at upstraight, and her face lighted

IIERE seemed no good reason for giving Burton such a melcoame. As he stood up there on the navigating bridge of the Diadem in the swiding snow, handling the great steamer with the art of genus, he looked very much of a man, in spite of his apparent lack of inches. All the passengers, and as many of the crew as could, watched in fascination the maneuvers of a lifeboat, battling with the long green seas in the bitter cold, midway between the Diadem and a partially dismasted windjammer from whose signal halyards flags snapped in the wind. The steamer was closing on the slop, to give the boat a short pull and make a lee for it.

The captain stood in the bridge wing, anxiously estimating distances, but he made no comment the seemed confident in the chief officer's handling of his steamer. That was not inephaced confidence. Nobody called the chief officer' Tisby on duty. Only in the less officers atmosphere of the off duty hours did the other officers use that name. And Debron was responsible for it in the first place. Debron, who at that moment handled the lifeboat out there in the roaming cold seas with much the same sort of inspired sads as that with which the big steamer was handled.

handled.

Debron had been mate of the subing ship in which he and Burton learned their profession together. Burton had been second mate. Both completed their apprenticeship and got their tickets at the same time, but Burton listin t the same commanding physique as Debron; the bulkier man got the preference in that first test of fitness, and perhaps it was right that it should be so, for there were many occasions under the square rig when brawn and muscle counted for much in a purch. There the two had remained pals. Debron always conceded superior brilliance to Burton. That was just. Burton secured his extramaster a certificate at the same time that Debron got his plain master's. But while together in the windpaniner, Debron lorded it in physical superiority; always protective; always jumping in to take the heavy work when any other second mate would have fought for it as a right.

There it was that "Tishy" was born. Decent, honest, stolid Debrou thought be did a wonderful bit of creative work in nicknaming his clium "Tishy," And Burton endored it, rather than fight a gleeful third mate and a half steekful of ribust 'prentices, some of whom were, at sixteen, bigger men than he was at twenty-two. But here, in the Diodem, it was different. He was entitled to some dignity. Debron was only second mate now; Burton a higher grade certificate had given him the sear, but Debron had introduced Tishy to the men, and of course the name stuck. That sort of name will. Therefore, standing by the engine-room telegraph, when all his mind should be centered upon his handling of the big steamer, Burton found betterness flooding his soul because Debron, the author of so many lattle unintentional injuries, had usurped the place in that heat which rightfully belonged to him.

Let' Debrou take the boat. He's a buskier man than you? I hat's what the captain had said. He had softened it a bit by making some remark about Borton stability to handle the steamer, but it had not fooled Barton. He watched the nathing slop and the boat as if he wished the one would run over the other, and with luck suck both.

What had seemed akely to be a thrilling hoat rescue, and a nice but of salvage to follow, developed into a simple towing job. It was annoying. That big steamer cost money to run, days of delay meant black looks from owners. Let a man could not leave that old windjammer skipper and his people in the lurch. Rather, his stubbornness in sticking by his ship merited praise. And so the Dialem's master agreed. The passengers cheered when Debrou took a line across, by which a towline was hailed aboard; they cheered Debrou binself when he came over the side from the boat. And when the steamer straightened out on her course, dragging the helpless sailing ship astern of her, they pruised the captain for the splendid manner in which he had handled the job.

Tishy ate bitter bread on the bridge until his watch was op, and then he went to his room by devious ways of ladder and alleyway in order to avoid meeting people. Never before hid he realized the full depth of the rut he had fallen into. In the matter of his profession he was bound to go shead. He was a keen,



Debron headed the best straight for the windparemer, a stripped and dismarted waif of the seas. The sid slepper porticulated and hawled at him

elever officer, a born steamship man, a navigational wigard He absorbed the modern gadgets of navigation, Gyro compass, electric sounding machine, radio bearings, and the rest, far more easily than poor Debron had absorbed the simpler rules of the sheer essentials. And both his captain and his owners knew his worth. But when he recalled the faces among the passengers, to avoid which he aneaked below, he gave way to a little exhibition of rage which might have amused steady-going Debron had he been privileged to see it.

Of all the passengers he knew, scarcely one regarded him as anything more than a pleasant, courteous officer who shone when a dance was afoot, who always looked dapper and smart, who, no doubt, was placed there just for the purpose of being looking, and doing just that. Debron might often be found in the center of a crowd of men, telling men's yarns, laughing very manfully. Debron might be found before dinner drinking a man-size cocktail with the smoking room habities. Tishy—be even thought of himself by that hated name in his writh. Tishy was always sought after at ten time, by the ladies, his the evening, he might be asked into the music index to sing. Not one, man or woman, of all those people, but doubtless looked upon Debron as a pillar of strength set there for their safe scalaring, and looked upon Tishy as a preity little fellow kindly put aboard by thoughtful owners to amuse their idle hours.

Tishy flung his cap into the bank, and grabbed a cigarette so savage vithat it broke into three bits. He hurled the bits at the cap, and swore. That is, he began to swear, caught sight of a book buf hidden beneath the cap, and caught himself up sharply with bitten lips. He had been wrong in his estimate of the passengers. There was one who looked up to him; who asked him questions about the sea, and ships, and the stars, who sat as if entranced while he spoke; who—

He grabbed the book, and swung on his cap, darting back on deck by the saloon companionway as if bound upon some very congenial errand indeed. The decks were deserted. Evening was at hand; the cold was piercing, snow still dusted the air, almost blotting out the wallowing old windjammer at the end of the long towline. There were voices in the smoking moon. The social half was aglitter with lights, at tikle with tea equippage. Tothy knew where to go. Sing in the let of the enginemon casing he found two deck chairs aide by side. In one, swathed like a maintain in heavy rugs, a bank-nowed old gentleman lay, with closed eves, only his beak of a nose and eyelids showing through his wrappings. A teacup and sincer clattered to pieces on the deck beside the chair, and the occupant of the second chair began to unwind as Tishy appeared.

"Father! Why didn't you give it to me?" queried a girl a voice, with a trace of weary patience almost overstrained. Then "Oh! You startled me, Mr. Burton in a much happier tone.

THE girl sat up straight, and her face lighted. It was easy to see that here was one person at least who thought pretty highly of Ned Burton. Blanche Torrey was small, and of the type that keeps its youth, when she amiled, she smiled from her circly black hair right down to her dainty toes, and whatever or whoever was near was the better and brighter for her smile. Perhaps that was why her ailing, bad-tempered father clung to her like an old man of the sea, rarely permitting her time to relax or take part in the amusements of the crowd.

"That's the fourth cup and saucer father's broken. He will not let me put it down, ever. Do you think they il send us a bill?" she smiled. When she looked up into Burton's face like that he forgot that he ever felt bitterness. He warmed through and through and not the least of his warmth was directed at old Colonel Torrey for his selfish monopoly of his daughter's time and care. That was not a kindly warmth, though.

"I don't think you'll be punished very severely," he said.
"They may possibly insist on serving the colonel's ten in a

tin mug. I came up to give you this," handing her the book. "This writer catches the real spirit of the sea as no other that I have read does. You'll find beauty in the one called 'Sea of Laght." "

FIFTHE colonel roused himself, and querulously waisted to be taken below to prepare for dinner. Has invalidity seemed to have little effect upon his appetite. Burton foldest up the rigs. and held the book while Blanche buttoned up the old man # coal, then opened the companionway door and watched the pair go below with mixed feelings warring within him. The steamer had only been six days at sea the had never met. Blanche Torrey before. He did not like old Torrey very much, but be did like Blanche. Liking was not the word. He was in love And a glow warmed him to the toes when at length he closed the doors against the snowstorm, and turned to go back to his own quarters. Just then be cared but little, if at all, for the face the world showed him. Let men call him Tishy. What of it? Let Debruo take the boat, get the credit. What of that? Debron never won a soule in his life like that which Blanche flashed back at Tishy Burton just before the door closed on the com-

Burton walked the length of the hurricane deck, past the smoking room. Voices, of course; warmth, light, and companionslup of men. What did he care? Burton half stopped. A cocktail seemed entirely in tune with his spirit. Through the big round porthole he ghaipsed the interior. There were all the habitacs. Big men of the world. Enjoying their voyage. Forgetting landwise cares. And in their midst was Debron. They were listening with jovial eyes and keen attention to some yarn he was spinning, and when it was finished the smoking room rang with their merriment. The last fleeting glance Tishy Burton shot through the port glass showed him Debron in a circle of hearty back-whackers, aglow and agleam with the natural gratification of a man, not yet old, who receives the adulation

of his fellows.

"Damaed hero worshippers?" growled Tishy, bending his head against the storm and hurling lumielf along the alleyway to the sech soon of his room.

S THE steamer dragged its A unwieldy tow into the waters near the coast, her pavigators began to look for sun or star to verify her position. For days the snow had blinded the akies. The steamer was sheathed in ice from nandships on the weather side to the dows on both index. On the tow, only one man was ever visible. Aboard that stripped and dismasted wasf of the seas, with her hare decks and lack of shelter, on y a belias-

man showed has nose outside. Seemingly with reason, too, for the wreckage was frazen 1410 a sahil lamp of grotesque form: ali of the old wastjammer from broken problem to strong of foremast was solid ire. Her forecastle head, anchors, capstan, headstays and ad had nothing of suspellane left. Roaring through the seas after the powerful steamer, the old ship took sprays in sheets, and already she was down by the head through sheer weight of

As the sings came within the anterpated range of the lightship marking their turning point, the captain was often on deck with his sextant. The second officer scarcely bothered to put his sex-

tant back in the case as long as there was a chance of a star appearing. And the officers keeping watches were on the alert through the might, anxious to get a night, for the deadreckoming of the past few days was none too certain, with that hunbering tow astern, drageing the steamer back, hanling her to one side or the other as she

sheered wildly to the weight of the ice fastened about her head.

Tishy suffered many moods in those auxious days. When he rould talk to Blanche Torrey, he felt as if the world was not only splendid, but that it actually belonged to him. At other times he was not so sure that he cared who the world belonged to. Why the devil did Debron want to plaster such a name as "Tishy" on a man? That was what Burton wondered And how grown men could derive picasure, or simple fun, out of calling a man by such a name absolutely heat hun. But he felt bitter about it, nevertheless. He hated Debron very heartily that evening when the lightship ought to have shown up. Burton was talking with Blanche, telling her about stars, and navigation, and some things not particularly concerned with either of those studies when Debron came looking for him.

OH, TISHY, the Old Man wants a line of soundarys," Debrug said, then saw the gul, apologized with a grin, and added. "The electrical sounder is not working well, Mr. Burton. It gave a jump from three hundred to thirty just now "

Burton went about the job in unforly fashion, taking a quartermaster along to the sounding machine, and can his line in proper style, but he seethed inwardly because the had heard hun called "Tishy" Debron again. Of course. Nobody but

that hig lout would think it funny,

During the night a star came out. Debron was on the bridge. Burton stayed up, too, for whatever he might feel personally toward Debroa, he was instinctively eager to fix the steamer's position. Burton stood with lun sextant just clear of the shelter of the bridge, patiently trying to hold a star in the field of maglass long enough to bring the image down to the bazy horison, His line of soundings had puzzled him. There should have been more water. If he could eatch a sight of that star--

"There's the light, Tisby!" Debron suddenly called softly from the bridge, "We're away up. It's almost abeam to

port "

Better call the captain if you feel unomy," replied Tisky. He was not on watch anyhow, why should be concern busself with Debron's mixietics? He went ahead with his sextant,

> pockeying the star down. He had not yet seen the light. Debroo could see it up there on the higher bridge. As a matter of fact, Tisky was not at all sure that the highlight was in night. So шкоу уобид велиго, кисh for rastance as Debrot, who would never grow up except in powerful physique, often rustook a star low on a basy hopion for an expected agl t. Judging by al. the eigns, somelings, and so forth, that lighter p should not be in might anywhere near the bearing Debron reported it on.

> Debron on the bridge muttered to hunself. He was a quarfied officer had a nuister a ticket and would be chagmed if, after calling the master, be were found to be unusely suxious. If that were actually the lightship, why, then there was no need for angiety, since the almogaal made her point as expected, and all that was necessary was to get

a four-point bearing for distance, enter at an the log, change course, and go shead full of confidence. Debron, as sensor second mate, was navigator; if he couldn't do that, he would hear something hot from the Old Man later on.

Tishy finddled with its star. The horizon was uncertain. But there flashed across his glass the stab of the light, and he stopped fussing for a moment and got the light into an angle with the stor. He held the contact for several minutes, and when he took the telescope from his eye, it was with a charp good of wonder. Another sight, another contact, and a (Continued on page 165)



The Truth about Poison Liquor



the W. V. Linder hemistry chief C. S. Internal Revenue stores a state of a very process about dens aren that would be course plies are and less harmful their words as that

FIATE Uncle Sam has been on trial before the har of public opinion, charged with no less a crime than willing and president

The Government of the United States and particularly the officials who enterespectation, stand accused of the arraposocial industrial alcohol and so injuring or k ling those was unlawfully boy and drank the liquor concocted from it by like degers.

These startling accusations followed on the heels of reports indicating an appalling increase in liquor deaths in the last year. Heightened by the recent to veriment order doubling the amount of the poison, the reports aroused a furor of protest and controversy throughout the nation.

Among the protestants were highly responsible citizens, including educators, jo ges, journalists, statesmen and clergy-tien. Typical among them was Dr. Nicholas Mucray Butler, president of Colambia, University "Murder" he declared. "Just plain, unadaterated murder by our glorious paternal Government, is what I think of the deaths attributed to the consumption of liquor

Behind the scenes in the new classical warfare R. H. Gammell and Chief Chemist P. A. Edward testing seized beach for word already in Government whomlores. New York, Most bustley liquor today contains this present

So much has been said both for and against the new Conveniment order that most of us have found it difficult to get through to the bare facts in the case Just what is all the har and cry about?

Briefly, the Federal Coverament, in order to supply industry freely with much-needed grain alcohol and at the same time make that alcohol unfit to drink, requires it to be denatured with wood alcohol, a violent poison. But since the alcohol so denatured can be obtained readily, large quantities of it pass into the hands of bootleggers. They, in turn,

How UncleSam Wages
Bitter Chemical War
to Put Industrial
Alcohol Beyond the
Bootleggers' Reach

By
FREDERIC DAMRAU, M. D.

attempt to "re-nature" it by re-dist ling or making" it. But it is chemically impossible to remove from grain alcohol all of the wood alcohol used in the denaturing process.

result is that much of the alcohol was alone to the public in booting gra, was to and other drade, is certain to the requirement of the possenger described to the possenger described to the possenger described to the possenger described and the second grades of unitatival alcohol.

produced every year under Federal services, at least 10,000 000 galious find their way into boot-

leg liquor. This, when other a gredients are added, will make about a quart of liquor for every man, woman and claid in the country. In fact, most of the bootleg liquor sold today has its source in industrial alcohol denstured with porson.

OlT of this situation have ansen the bitter complaints that I note Sam is trying to posson those who will not obey the pro-inbition law. The accusers, on the one hand, charge that the Government, knowing I well that some of the poisoned

I is well that some of the poisoned bearer will be consumed unlawfully, stands responsitive for deaths caused by drinking it. Some have gone so far as to accesse the authorities of seeking to terrorise

the public into abstinence,

On the other hand, defenders of the Government's course contend that the bootleggers and not the Government, are the real murderers. They argue, too, that the victims of poisoned biguis are really sucides, that the Government cannot be expected to protect a camen from his own foily, that, anyway, most deaths are due to excessive drinking rather than to the poison, and, finally, that most of the fins about poisoned liquor is, after all, anti-prohibition propagands.

There you have the two sides of the argument. Strangely enough, though,

neither has emphasized the unanswerable accent fic fact about the whole business. It is this: The reason Uncle Sam requires the use of wood alcohol as a denaturant, is that chemistry thus far has been unable to discover a less harmful way of preventing the conversion of industrial alcohol into a beverage fit to drink.

Wood alcohol has proved to be the only known denaturant which bootleggers can't "cook" entirely away. This is because it boils at approximately the same temperature as the pure grain alcohol with which it is mixed. Bootleggers' chemists may be able to distil it off up to a certain point, but beyond that point the grain alcohol boils away with it.

THIS is about what happens: Grain (ethyl) alcohol boils at seventy-eight degrees centigrade; wood (methyl) alcohol at sixty-five degrees. When the bootlegger puta denatured alcohol into a still and raises the temperature to saxty-five degrees, the wood alcohol will begin to bon, evaporate and pass into the concenser, but not all of it will evaporate until a much higher temperature is reached. Even if he raises the temperature to the boding point of grass alcohol, the evaporation of the wood alcohol will not be complete. Before seventy-eight degrees is reached, the grain alcohol will begin to evaporate along with the wood alcohol. The two never can be entirely reporated. The double dose of wood alcohol added by Government regulation at the beginning of the year was intended to make industrial alcohol not twice as posonous, test ladf as I kety to be atorzed

in the hands of manufac-

turers and chemists one of

the two most useful chem-

mal solvents known-in

quantities and at a cost that made it commercially practicable.

Out of its use have grown some of our greatest industries, as, for example, the manufacture of explosives, artificial silks, products such as celuloid, perfumes, extracts, and freeze mixtures, and so on. Today it is indispensable to some 200 industries, and wonderful new uses for it are being found continually. It is vital to chemical progress.

As long as there was plenty of potable inport to be obtained, no one ever thought of drinking denatured alcohol. But when prohibition came along, and later when sanggled inport became harder and larder to obtain, bootleggers turned to the industrial product. And then the trouble began, There developed a keen chemical warfare between the chemists of the bootleggers on the one hand, and the Government chemists on the other. The former were bent on "cooking" out the denaturants; the latter were equally intent on preventing them from doing so.

NOW, many different ingredients have been employed in many different formulae—about sixty in all—for denaturing alcohol. The Government divides the product into two general classes completely denatured alcohol and specially denatured alcohol. For the former, wood alcohol is used almost entirely. For the latter, the method is vacied according to the special requirements of the industry in which the alcohol is to be used. For example, brucine, a posion closely related to strychime, has been largely used as the denaturant for making "beauty" preparations and harbers' supplies. Neces

the as went to be asserted to the asserted to

alcohols fell one by one before the ingenuity of the bootleggers' chemists. They found a way to remove brucine by repeatedly distilling the alcohol. They did the same thing with meetine and other denaturants. So successful were they, in fact, that the Government at last was compelled to tighten the restrictions on the sale of specially denatured alcohol and since then it has been sold only by permit under heavy bonds.

This has left completely denatured alcohol the only alcohol easily available. There are no restrictions on its sale, for no amount of chemical skill can remove all the wood alcohol from it and make it fit to drink. It is sold everywhere, in any paint store or public garage, no questions

naked.

Wood alcohol may cause violent illness, blindness or death after the consumption of a surprisingly small amount. In mud cases of wood alcohol poisoning, the mental processes are benumbed and clouded, there is marked loss of memory accompanied by extreme disances, which may be followed by death. Highly possionous does produce overwhelming prostration. The patient stake rapidly into come, and death may come with a twenty-four hours, or may be delayed as long as a week.

WOOD alcohol, moreover, is intensely poisonous to the optic
nerves. Permanent blindness may result
from a single drink. Under the new
governmental order, completely denatured alcohol will contain four percent of
wood alcohol, instead of two percent as
formerly. Also it contains small perrestages of kerosens and pyritine to
these all state are apposable.

Manifest Continent chemists are works a unit of to discover a new and more of the same smell, and at the same

to make industrial alcoholubus lately worthless for beverage purposes and therefore auto.

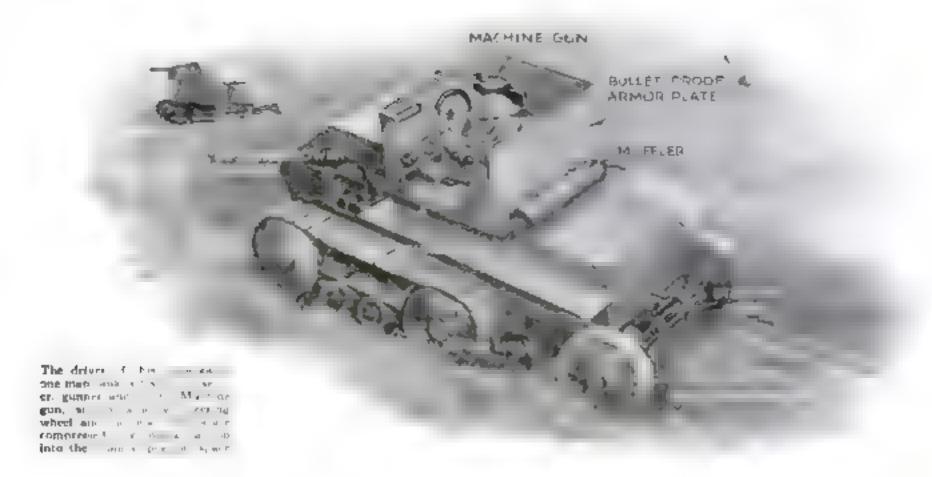
It is a likely problem, one

which has long ballied chemists.

As this is written, however, reports from Washington indicate that a solution may be in sight. J M Doran, head chemist of the Prohilation brill goceatly annothers the development of certain evismelang and but tast og od comnounds which combined with wood alcohol. would advertise themselves like a had egg in an omelet, and banish forever any desire to consume the muxture It is impossible by any known method, he save, to rid the alcohol of these oils.



What appeared to be an innocess truckload of lumber turned out to be a bootlegger's impurious device to transport booch, when the odor of a broken bottle betrayed this vehicle to Los Angeles prohibition agents. Seventy cases of liquor were taken from the interior which a entered by a trapdoor of board code. Above: Typical still 50-galton capacity with which bootleggers chemists try to " cook " the wood alcohol out of industrial alcohol. Federal prohibition officers improve as many as 170,000 of these in a single year

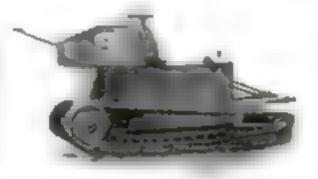


Amazing New Engines of War

One-man tanks give artillery new mobility, while huge monsters haul guns, lead attack, or belch poison gas

RMOR CLAD scooters duching across a battlefield, spitting leaden death from proteiding gan barrels—atecl pagerns its that belch clouds of lethal funces will these land craft decide tomorrows battles? Latest of peace-time inventions, the new tanks are ready to play their part should war again grap the world.

When premers of the British doons ions assembled recently at Camberles England, they viewed a startling display of the latest war machines in action Fleet one-man tanks, motors rouning, caterpallars whiching, raced about one swarms of monster ands. Hubber eraft careened over the pitted field at twenty inness an hour, hand og hinge guits. Yn experiment in the ast war, the lank of



The gunner or a spredy whipper tank crouches behind a revolving turict

the fotore, illustrated by these machines, may strike terror in whole armies.

Beough the single machine gun of the one-man 'whoppet' tank pictured in the center of the page, one of the new British inventions, the gunner cronches as he charges against the enemy. A battalian

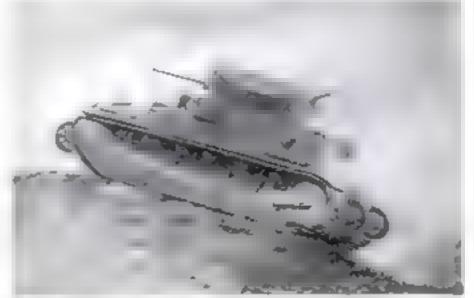
of these speedy machines might overwhelm an army on foot. Another novelone man machine, sketched above, adds a pair of rubber-tired steering wheels at the rear. It, too, is a fast craft.

From Warsaw, Poland, comes news of a tank recently treet out that looses possess gas from grisly steel cylinders stong on its roof. It is purtured at the left below. It mel-shaped projectors release a flood of deadly finites. Again, battleships on caterpolar treads, monster tanks with gan-spaked tirrets, crosse overland against nostile armies.

Unly a shell a direct lat can harm these bullet proof machines. It takes time to make a log gam. The new tanks, by virtue of their speed, are somewhere else by the time enemy guiners have found the range.



Impervious to bullets, this latest Polish war machine bulches possess gas as the entmy's midst. Its mid-shaped feel transples obstructions



Wheels speed this battle craft along transport reads. A lever lifts them up and drops the craft on its exterpillar tread for cross-country crusts

Stories of Wonderful Dogs with Hearts of Steel, and of Wild Races with Death across Arctic Snows

BOBY BROWN, beloved Maskan masner, prospector and dog racer, was dying. A boaz saw had severed one leg above the ankle and had thrown him viocent ly against a piece of shafting, breaking the other leg and causing internal in pures. There wasn't a doctor in Dime Creek, where the accident happened. The nearest surgeon was at Candle, fifty-eight miles away

Between Dane Creek and Candle lay a desolate, wind-swept, snowbound stretch of wild Alaskan country. The thermometer registered thirty below. Night was

Bobby Brown's friends were in despair. Tenderly but crudely, they attempted to

stop the ebb of lustifeblood and ease his paint. But only a surgeon could save or prolong his life.

Lieu came the

Toru came the electris of news that Leonhard Seppala, king of the Arctic trails, was near by with his team of Scherma sled dogs—the same team that had wrested the dog-racing crown from the head of "Scotty" Allan—the fastest team in the North.

INSTANTLY.
hope for Bobby
Brown flamed in
the hearts of the
men of Dime
Creek. Seppors
meant speed, medical assistance, perhaps life. If any
body could run a
victorious race with
Death, Seppola was
the man—Seppala

and his great leader, Togo, and his other fleet-facted Siberian dogs.

Summoning Seppala, the miners tenderly lifted Brown to an improvised cot and placed him on the great musher s sled. Although he was in great pain, Brown looked up into Seppala's eyes and

By

Jack O'Donnell

anded a brave gesture of confidence.
The next amoute Seppala eried,
"Mush" Togo and his fellows spring
rate action and, while the group of
prespectors and movers of these Creek
waved a sitent tool-peed the sled moved
off

For seven and a Latt hours Seppala drove his dogs through a blinding, sting-

Leonhard Seppala, who Breeds and Races the Fastest Teams of the North, Tells of His Amazing Adventures

of his passenger, to Togo, his leader, And Togo, aware of the trust, bent his head to the blazard and map red his fellows by his bravery, his stamina and his intelligence.

It was almost ten o clock when Seppala sighted the lights of Candle. Half after the hour the errand of mercy ended—at the hospital.

Bobby Brown, still conscious but weakened by loss of blood, sunted its gratitude to Seppala—and Togo—as he was lifted and taken to the operating table. Seppala had won a temporary vistory, at least, over death, for, despite the fact that Bobby Brown died two days later, the stricken man lived long enough to see members of his family.

That race against death in the face of fearful obstacles, is talked of whenever Alaskans get together. Beppala himself makes light of it, just as he does of his grantic feat of covering \$40 is the bistoric anti-town race to Nome in the winter of 1925.

"TT WAS the only L thing I could do for a good friend," he fold rac in New York recently. "If anyone deserves credit, it is Togo, my lead dog. After all, a musher in only as good as his dogs. If Togo or the other n netcen Siberious to that team had failed, I would have failed and Bobby Brown would have died on the tend.

"Up there"—
meaning in the Arctic regions—"that
sort of errand is part of our everyday
lives. We make no particular fuss about
bravery. To us in Alaska the antitoxin
drive, for instance, was nothing to get
excited about. A number of persons in
Nome were suffering from diphthema.



Over the fraces wantes of the North race these resum of swift-footed buildes -bearing mails, pursengers, messages of life and death. Capable of tremendous speed against fearful odds fearless as their tember wolf ancestors. Photo above Seppula's lead dog, Togo. On the lead dog's courage, intelligence and power of leadership depends the behavior of the entire team.

ing blueard, neither man nor dog giving thought to hunger or thirst. Over fifty eight miles of snow and ice covered trails, the dreaded spear ice cutting into their belies, the twenty dogs mushed onward. When inky blackness settled over the trail, Seppala trusted his life, and that

The doctors needed antitoxin. There wasn't any of the serum in town. There were 300,000 units of it at Nenana. What was there to do but go to Nenana and get it? Nothing! So it was done."

"So it was done.

The phrase aptly expresses the attitude of these men of the North toward their daily life, whether that life be devoted to mining, prospecting, carrying the mult over wind-swept trails, racing the dog teams, or establishing a town on a new

gold field,

Invariantly the dogs are important factors. When, in 1896, Alaska was the Mecca of thousands of gold-hangry adventurers, the cavilized world discovered that in the North existed a breed of dogs of marvelous stanuna, speed, and courage. These were the native Alaskan dogs caded Malamutes or huskies, strong, redoubtable canines ared by wild dogs and timber wolves. Because railroads and other means of transporting men and supplies over the snow-covered waster were unknown, these dogs were pressed into service. Throughout the length and breadth of that land rang the stentoman command "Mush!" a corruption of the French word marchone, the cry of the earry French voyageurs to their dogs.

WHEN dog racing became the major sport in Alaska, mushers like Seppala, "Scotty" Allan, "Fox" Ramsay and "Tran Man" Johnson burned their attention to the improving of the breed of dogs.

Ramsay, an English remittance man, imported Siberian sled dogs and raced them with surprising success. Seppola followed mit and today the biserian sled dog is considered the last thing in racing animals. He is especially describe in long hauls, being tireless, courageous, and endowed with great strength.

Dog racing, however, is not the chief reason for improving the breed of sled dogs. Until Alaska is covered with a network of milroads, the dog muster and his dogs will be indepensable in transporting passengers, mail and supplies.

Being highly intelligent animals, the improved breed of aled dog is easily brained. Kindness, firmness, and appreciation are the three ascentials. Once a master tells a dog to do a certain thing he must must upon obedience until such time as the dog obeys.

In order to obviole impulsiveness and instill a spirit of stoicism into the beasts, the dogs are framed to await their meals with a minimum of barking, and to eat if or doily ration without that avid voracionances that characterizes most

carnivorous animals.



"King of the Arctic Trails" Leonhard Seppels was known from end to end of Alaska long infore he was world-under lame as here of the historic antiques rate to Norse

Seppula a own astounding control over his dogs was the subject of aimazed comment following his recent speciacular victory in the second aimual point-to-point race of the New England Dog Club. One racer even attributed it to a kind of hypnotism. "He doesn't drive his dogs—he just 'clucka' to them and they lay into their collars harder than I've ever seen dogs do it before. Something comes out of him and goes into those dogs with that clucking!"

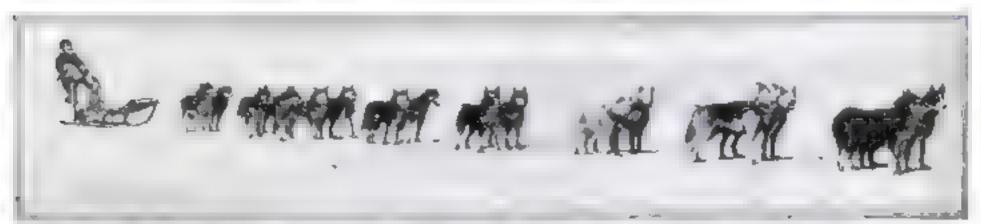
Seppala says there are thrills aplenty in the masher's life, but they come unexpectedly and almost invariably in the absence of an audience.

There was, for instance, the day he became lost in a blutantid during the 1914

All-Alaska Sweepstakes, the dog-racing

Seppala ran into the blizzed about fifty miles from Nome on the way to Cande. He was on a new tran and the dog team, led by Suggen, stre of the now famous Togo, was making fair progress despite the high wind, snowdrifts and bitter cold. In a bill of the storm the great Norwegian musher realized be was lost.

"But I knew that if I headed due North I'd find a trad," he told me, "so I tried to steer in that direction. Suggen, however, kept trying to lead southwest. Somehow I did not trust the dog's instruct, and kept him to the northern course. Presently (Continued on page 134)



Winners all! Reppale and his Siberians, each a thoroughbred of the North. Their owner a most recent victory was the New England aled dog derby



Members of the Aerial Experiment Association, 1908. left to right, "Coory" Saldwin. Selfridge, who designed the first plane flows by the group, Glenn Curtum Bell, inventor of the telephone, McCordy, just getting around after a crash, and, as guest, Augustus Post

Glenn Curtiss—Air Pilot No. 1

Impressions and Reminiscences of Stirring Days of Experiment and Achievement That Changed the World

By FRANK PARKER STOCKBRIDGE

DON'T remember when or how I first heard tant a couple of young men named Wright had actually flown a heavier-than-air muchine. said Glenn Curtim in response to a question I put to him as we chatted one day m his Florida home. "Perhaps Captain Baktwin and I discussed it after the news of their experimental flights at Kitty Hawk had appeared in the newspapers; but if we did, it didn't make a lasting impression on me. We weren't thinking of heavier-than-air machines then; all of our interests were centered in the dirigible. It is quete likely that I was skeptical, like almost everybody else ?

As a matter of fact, there was a general and quite fixed belief twenty years ago that man would never fly in a machine which did not have some sort of a balloon attached to it. That view was shared by the United States Patent Office, which did grant several patents on flying machines before the Wrights proved that the world was wrong in its opinion, but they all had some kind of a lifting device. Mr Curtiss remembers seeing the drawings of one of these inventions. It was provided with a harness to which were attached a dozen or more live eagles! That was a

sample of what most people thought of when they talked of fly ng marlunes.

If Giran Curtus had any other thoughts on the subject of arpianes they probably were to the effect, he says, that Professor Langley's unsuccessful attempt in 1903 to make his "serodrome" fly was proof that pobody would ever fly in a machine which did not have inherent buoyancy. The failure of "Langley's folly," as the machine was called in the new spapers, had brought unlimited ridicule. It seemed, in the minds of most people, to settle the question of the airplane. The dirigible was the thing. And Captain Thomas S. Baldwin and Curtus

MR.STOCKBRIDGE writes here another brilliant chapter, the second of a series, in his absorbing story of a great pioneer of American aviation. The installment is complete in itself, so you'll enjoy it even if you begin the series with this issue.

had hadt and navigated and delivered to the United States War Department the very first dirigible ever bought by any government. That was in 1905, about the time that the first news of the Wrights' flights began to leak out, although they had actually got their macline into the air on December 17, 1903.

"I HAVE never been much of a prophet," smiled Mr. Curtus, "I could not foresee, then, that within three years I myself would win the first American prize for flight in a heaver-than-air flying machine; that within ten years I would even fly the Langley muchine."

I reminded Mr. Curium of one of his attempts at prophecy, made in the early days of aviation, to the effect that a speed of 130 miles an hour was about the limit of practical speed for an airpiane.

"It does sound foolish now, doesn't it, with speed of above three hundred miles an hour already accomplished?" be responded. "Still, I erred on the conservative side. I based that statement on the belief which I held in common with others who were experimenting with fight, that the maximum speed of the plane could never be more than double

the minimum speed. Now, the most mum speed at which the plane will stay right side up is the landing speed. I couldn't imagine anybody landing a plane at a higher speed than seventy five nules an hour. I thought I was stretching it a little at that; so I guessed at the possible speed in flight at 150 miles. Now however, planes are built with a told to speed of above three times their landau. speed, and can land at name now an hour, giving 800 mates and a rear the high speed to flight. I am the represent to set any limits to the position of a min-Inture.

"NOT even thu?" I suggested, picking up from among a pile of photographs on his desk a draw of importing the trans-Atlantic passenger surplane of the future. It showed, not a flying boat but a flying ship—a regular three-decker. triple-winged, glass-enclosed, with a luxurious saloon on the upper deck, obviously accommodations for scores of passengers

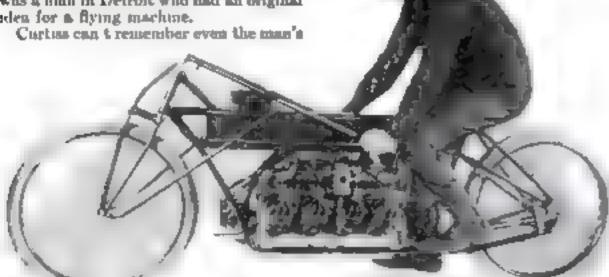
"Not even that," he came back promptly Trans-Atlantic flight on regular schedules is bound to come. It might have come sooner but for the war. We were must getting ready for the first real attempt to fly across the ocean in 1914; then everything had to be subordinated to war needs - speed, maneuverability, altitude. The development of the airplane and the flying hoat took a direction then

from which it is only beginning to return. But it is as inevitable that frame-Atlantic flying service will be established as it was that trans-Atlantic telephony

should be."

BACK in 1905, however, motorcycles with dirigibles "on the side" were at il occupying Glenn Curium' attention. With Capton Baldwin he built dirigible after dirigible for exhibition purposes; personally he took his Curtiss motorcycles to all the important contests, and continued to win troplace and money prizes with unfading regularity.

Other people were thinking about heaver-than-air flying machines, though, One of them was Prof. Alexander Graham Bell, inventor of the felephone. Another was a man in Detroit who had an original idea for a flying machine.



The giant eight-cylinder motorcycle, driven by Curties himself, which, at Ormand Beach, Florida, in 1907, made a record for two-wheelers that still stunds—a mile in 26 seconds

name now, but he wanted a motor built to fit a flying maclone, of which he sent Curtess a sketch. It was on the general mes of a length of e copine, being a cylinder with a which he proposed to mount an east out a propeter He would est be expro of a double effect the the latter state \$4.7 at he can save ex racer won a fer a to bit the apparatus from the ground, while the force of the expelled are at the other end would push the machine to rough the air. Custos "dol. 1 11 ac much of the idea." but the man's credit was good, so he undertook to build the engine

It was the largest engine of fund ever coverage to the Pyline ders and while are my reads. to build it, he wondered what an eagine like that would do



Abenaburt & abam Pella e ration in late a terre app ce y throng report most t developed I premions 5 bg ware seen a many Pr. m. facu 1 g - if tions to an attention when our greats weren a the order actor or day.

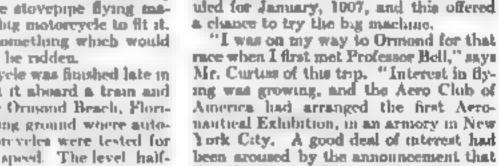
on a motorcycle. He had won prizes in all the motorcycle contests he had entered, but he wanted to go faster than anyhody had ever traveled before or was likely to travel. So, while building the engine for the stovepine flying machine, he billt a big motorcycle to fit it. He knew he had something which would go fast if it could be ridden.

2577 At.

The big motorcycle was finished late in 1906. Curies put it sheard a train and started with it for Ormond Beach, Florida. then the proving ground where automobiles and motoreveles were tested for

mile-wide beach

stretching thirty indes



straight away, with its water-packed

sand, is stul one of the world's greatest

speed courses, though the Indisaspolis

Speedway has displaced it as the otheral

testing ground. There was a meet sched-

been aroused by the announcement that the Wright brothers would make an exhibit, and so they did, but their exlabet turned out to be the crank shaft from the engine of the plane in which

they had made their first fights.

"PEOPLE who had expected them to show a complete airplane were disappointed, but they were right in not disclosing their invention. Their foreign patents were still pending. They might easily have forfeited their rights by showing at that tune how their plane was controlled."

Professor Bell had ideas of his own about flying. He had watched Professor langley's experiments closely from their beginning, and had been especially interested in the engine, designed by Charles M. Manly, with which the Langley machine had been equipped. That had been the lightest-weight gasoline engine ever built up to that time, weighing less than two pounds to the horsepower. But the Curtiss engines designed

much else about that event.

I wore no goggles and had no special costumo except a

belinet of my own make and

a leather coat, but mounted

the machine in my ordi-

nary clothes, bent down

over the bandlebars and

started off. I couldn't see

anything but a streak of

beach with a blur of waves

on one aide and a blur of sand bala on the other.

Then the crowd was cheer-

for use on dirigibles were more powerful, just about as light in propertion to their power; and, at the Aeronautical Exhibition, Gleon Curtiss found Professor Bell absorbed in the study

of them.

"That was how Professor Bell and I met," Mr Curtiss said, "and I found him an enthusiast on the subject of fight. We insked about the reported success of the Wrights, and about the gliders with which Octave Chanute had made pumercon experiments with air currents is the sand dines of Lake Michigan's southeastern count. Professor Bell

thought that Chamite, the Wrights and all the rest were wrong in trying to fly fist planes. Safety in Hight, he assured nie, was to be found in the development

of the tetral edral late.

" I'll word tetra ostral' rather floored me, I guess. I me sure I doln't know then that a tetrahedron is a form bounded by four triangular surfaces—in other words, a

three-cornered pyramid, and Professor Bell had to explain it to use. He had been expenmenting with kites made up of a great numher of tetrahedral cells, two of the four sules of the tetrahedron being formed of solic like a pase of wings. The kites hash flownwith great success, at his summer home at Buddeck, Nova Scotm. He had even sent a man nkoft on the kite string. and had made seeint plantographs, the precursors of the airplane photographs so familiar today, with a camera nitociad to the letrahedral kete

"If he could build up n block of these tetrahedral cells in the right ahape and size, and attach to the whole an engine of the right type and weight, he believed a machine would resalt which would rise by its own power, carrying a man. He thought the Curtess engine was the thing he wanted."

FTER talking with Curtiss awhile, A Professor Bell concluded that the young engine expert might be useful in helping develop his alea. The upshot was that he sovited Glenn Curtiss to visit

him during the following m mmer at his country place at Buddeck, to tak about flying, and Curtiss promptly

necepted.

From that momentous meeting, at which Glenn Curins' thoughts were turned definitely toward artificial flight as distinguished from ballooning, the young man went to Florida and at Ormond Beach, on January 24, 1907, drove his eight cylindered motorcycle faster



One of the gliders Curtis built at Hammandsport, N. Y., early in 1908, for preliminary experiments in flight from the hillordes of Lake Kruka. Neither he nor the other members of the Arrist Experiment Association had ever been in a plane, and this was to give them the "feel" of being in the air

than any two-wheeled vehicle was ever driven before or moce; faster, in fact, than anybody had ever traveled up to that time anywhere in the world!

A rade in twenty as and two-fifths seconds was the manying record which tdenn Curtiss set on that day. It is a record when still stands for motorcycles, although the guant machine, conforming

ing, and that was all there was to it! After an interval of a few months spent in the motorcycle factory at Hammondsport—a corporation now, the G. H. Curtiss Manufacturing Company-followed the memorable

summer of 1997, at Buddeck, with the three ardent young men who, with Curtus and Professor Bell, formed the Aerial Experiment Association, out of which were to grow such epock-making developments in the art of flying.

The others were two young Canadian engineers, P. W. Baldwin and J. A. D.

McCurdy, and Lacu-tenant Thomas Selfridge of the Unsted States Army, Bandwin

had been assisting Professor Bell in the construction of his teleshedral kites. He was not related to Captain Thomas Buldwin, assocsaled with Curbin in the development of the dirigible.

T'O DISTINGUISH I the two Baldwins, the nickname of "Casey," derived from the baseball poem, Casey at the Bat." was attached to the younger, and he is at it referred to by has former associates in

proneer aviation as "Casey" Baldwin.

McCurdy was the son of Professor Bell's photographer, who had done such excellent work in making aerial photographs from lates and was the inventor of the daylight developing outlit for roll film. Lieutenant Selfridge, a recent graduate of West Point and a young man of remarkable pronuse, had been detailed by the War Department to work with Professor Bell in the development of the flying maclime. The word "'neropiane" was none too well established,

> and its Anglicused form of "amplane" had not come er to use then Professor Langley had called his machine an "acrostrome, and that was the term Professor Bell used for his tetrahedral de-

Nobody could foresee then that young Selfreige was to be the first man to lose his life in an airplane accident, k lied in the crash of Orville Wright's machine on its first public (Continued on page 113)

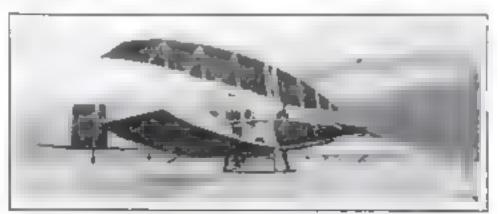


The White Wing, first explane ever flown by Glenn Curtee, on the day of its remarkable flight in May 1906 when it rose in the sir to real fly ng beight rovered a distance of 1 91? feet, and landed undamaged as a pigwed field. Its wings were rotton conted with varuab

to no accepted standard of design, was entered in a class by itself and the record is therefore not an "official" one under any of the rules governing motorcycle contests. This record shood for every class of land vehicle until 1980, when it was beaten by Tommy Millon in a racing automobile. But no two-wheeler has ever beaten the Curtiss record.

"How did it feel to go faster than you had ever gone before?" I asked him.

"I remember it satisfied my speed-craying, similed Curtus, "but I can't tell



Not so incley so the White Wing, the Red Wing, above, first plane to be built by the Aerial Experiment Association, creabed on its trial flight

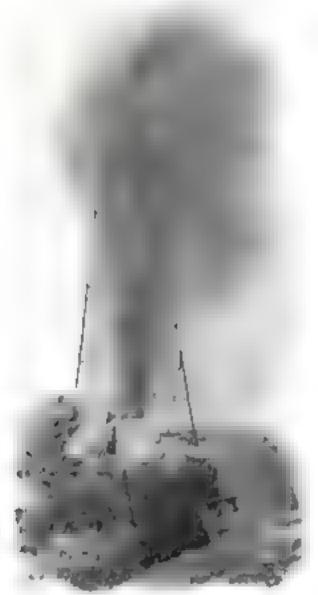
Electric Hands Prevent Wrecks



Men who Blast

How Nitroglycerin, Strangest of Deadly Explosives, Is Used to Release Vast Stores of Oil

By Jesse F. Gelders



An Ohishoms oil well a few accords after a "shot" had transformed a from a dry hold into a steady flowing quaker. "Shooting." a well required attenting nerve and cool headedness for a tengly-cess the agent used Is senong the most powerfus explosives known

WO autor were meing each other along a road in northern. Oklahoma. From the opposite direction appeared another car, carrying a rack of odd-looking tin cylinders at its sale. The racers came abreast of each other just as they passed the third machine, and though it swerved to avoid a collision, the inside car grased the rack, sent the cylinders

cominging to the ground, and raced on w thout a stop.

Probably the speeders never knew how great a risk they had taken. That third car was loaded with 120 quarte of nilroglycerin. Its driver, Willia Hill, was on his way to perform his regular professional service of "shooting" an

Hill got out of his car and replaced the till cylinders, which were empty shells. Then he drove on, the brightly painted letters on his auto flashing warnings to times who cared to read: "DAN-GER-ENPLOSIVES."

If the racers had smashed into h.m and caused his cargo to explode, no one, later, would ever have known exactly what happened. A junkman seeking the wreckage of three autos might have been lucky to find as sizeable a fragment as a bolt!

Hill bimself recalls one story of an accident in Kansos. A nitrodriver, on his way to Neodesha,

was haded by a pedestrian who wanted a

"You see what I'm hauling," said the I m not allowed to pick any-

' I'll take a chance," the stranger in-

sisted, and bually had his way

Visort a nule beyond Independence the man began to think differently, and asked to be let out. He started walking, and the car drove on, passing over a small half. A moment after it was out of sight, the pedestrian heard a terrific explosion When he ran to the aummit, the car was gone. Signs of wreckage indicated its fate, but what had caused the blast remanied a mystery. Only the full between had protected the pestestrian.

A well-shooter's job is not for a nervous man. Hall's route to a well often leads him off the mun highways on to dist. roads where the jolts seem to threaten motant disaster. But he always takes the humps safely. It is a part of a well-shooter's work. Comparatively rough raling is made possible by his method of leading the car, performed with the same measured care which marks every pluse of 149 Job.

He lives by the rule, "Handle with

care." He dies if he forgetant

A historical photograph—America's first off well, drilled by S. 1. Dealer at Oil Creek, Pa., in 1859. Compare this crude wooden structure with the modern frame above

A few weeks ago Hill was shooting a well. When he reached his destanation, the production superintendent miniedistely gave him the delais of the situation. The hole was nearly 5,000 feet deep-It had penetrated into the sand in which oil was expected, and the baler had brought out slush with showings of oil. But it did not flow, So far, for all practical purposes, it was only a dry hole in the ground, dug at a cost of \$40,000.

NOT every oil well is shot. But hundreds of them are. Notady has ever been to the bottom of one, to fin: out what happens when a charge of astropy error or exploded in it, but the theory is that some petrocenn-bearing sands are so dense or lard that they prever t the oil from flowing rate the well. A blast shatters these crusts, lets the oil facough, possibly opens new cresices to near-by pools.

Hill prepared to place a shot. He strung a wire cable from a w ndjasi in his car over a pulley at the dernok. He filled one of the empty abella with natroglycerin, from the causi in which it had been hanled

With the loasted shell, he walked toward the well, pick ng his way emitiously over pipes and timbers. He moved with care,

for one misstep might have meant distates

Wita the shell booked to the wire cable, he lowered it into the well Nearing the bottom, it entered a muxture of oil and water, standing many yards deep in the hole. That woold act as "tamping" when the introglyceria was finally discharged beneath it, like a submarine torpedo. When the shed was deshells were lowered upon it.

Then Hill prepared a "squib," a much smaller shell, with a detonating cap and a long fuse, all encased in a slim, tin cylinder, a highpowered messenger which would say "Go!" to the charge a half mile underground. He lit the fuse and dropped the squib into the hole.

Its journey was a long one, the last lap through a column of water It was timed to explode after a safe interval on top of the last shell.

H.ll stood a short distance from the dernek, alert.

"There it goes!" he said at last. To others, there was practically no sound, not a tremor of the

for Liquid Gold

ground. But he was right. In a few moments there was a lassing at the mouth of the well, a midden rour; and a black geyser spouted unward!

The driling crew began to cheer. The coar grew fiercer, the stream shot higher. crashing against the top of the rig nearly a vice red feet above

"It's elegating itself all right," commented 11 11

The accumulation of oil seepage and water which had noted as tamping was being luried up. When this waste buil been il rown eff two of the arriving crew went up to the Gernek with crowbaca

and turned a valve, which sent the fresh oil paur ug through a pipe into storage tarlos. The oil well was flowing!

The preduction of that well measured 400 parrels a day after it had settled to a steady flow. The for a too rand dolar hole in the ground and been to rued into a property worth about \$700,000.

Few men see so many fortunes made as a veteran well shooter. Sometimes be sees the despute of fature, but for when there's no oil in the ground, introg's wein rar t pr t f t iere.

Walls Hal is a veteran, having shot wells for more than twenty years.

"T STARTED back in Wood A County, Olio. he recalls, that the well-doubling becomes a gan long before that—in Pennsylvansa soon after the Civil War

"Those were the days of the 'monolighters A man na -Reserts but I some patents coverwell a most up, and every body to wanter, the work dots has to; area. The producers though -was clarging the rately and b now the fight storted. It was be my day, but I ve beard son the old-timens tell of t

When Roberts learned that as

owner had had a well shot without er guging him, he would hate the ring to court and force han to pay for the use of the patents.

Then came the "moonlighters," wellshooters who did their work in secret. In the still of night their wagone rolled along the Pennsylvania ronds. handing nitroglyceria. and by the dim light of the moon they would



Willia Milk, veteran well absorber whose thrilling experiences probably won't tempt you to follow ha dangerous footsteps? The earn cylinder is a squib listed to detenate the nitrogiyeerin

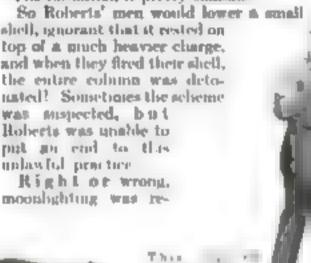
lower their shells and set them off

But soon these jobs were discovered by the alert Roberts forces, and the producers again had to pay. Whereupon a more subtle plan was evolved.

The moonlighter would come with las nitroglyceria and shells, and put them into the well. Then, without detonating them, he would steal away The owner would then send for Roberts. The latter's fees were fixed according to the smount of nttroglycerorused. The producer with lawners stictly, or "sleepers already at the bottom of the well, would

engage Roberts to place a light shot. "We don't need much," he would say "The formation is prefly shallow.

shell, ignorant that it rested on top of a much heavier charge. and when they fired their shell, the entire column was detanated! Sometimes the scheme was suspected, but Hoberts was unable to part an end to the unlawful proctice





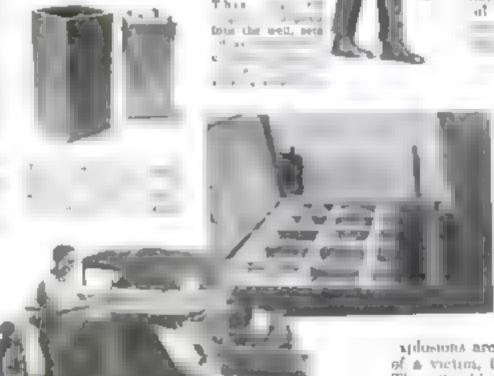
garded as a romanise and not unworthy pursuit. Today most of the oil fraternity look back upon it and chuckle. Some of the men who were mountighters in those early days are still active in various at field exterprises. One of nt is a director of a bank central is oil financing.

well over Los Angeles, California

ILL is reticent on I the subject of d saster and augusts in v I-shoeting, but a partial list of men wen Ind been engaged to shooting oil weds, pub-I shed ten years ago and uncluding 14" range, showed that actions of those menand out of every 1116 had been kiled by explosions. The little hooklet's descriptions of the sixteen fatal

aplusions are terse. There is the name of a victim, the date, and the location. Then it adds, "at magazine," or "with or "with car." Usually that was 1 a was known.

You in get some idea of the force of these explosions from what happened at our near Altoons, Kansas," Hill said. "A truckload blew up there and made buildings tremble (Continued on page 125,



A car that usually has the road to itself. Willis Hill is shown here loading 150 quarts of estrogly-erist parked to compartments as shown in the upper illustration, into his automobile

Now—Traffic Rules for Aircraft

Government Regulations Provide No Speed Limit, but Give Balloons Right-of-Way over Planes and Require License Numbers to Be Visible

By H. C. DAVIS

ID you get your 1927 pilot's becase? It's something new lake the rules for noto drivers are the traffic rules for arcraft just issued for the first time by the Accounties Branch of the U. S. Depart-

ment of Commercia Reading them, it is casy to imagene the stay when the air wid he thick with misplanes, and traffic others may direct the streams of fivers from emptive P#Iloons, Now right-ofway and been a numhere belong as much to the air as to the inotor road, as set fort) in the Governs ment a new rutes.

First rule of all. you must have a pilot's license-without this you cannot take the air unless you would rock a \$300 line. There may be as yet no "motor cops" of the air to blow a whatle and shout. "Pull over to that bill-let's see your beense!" but it is well to carry on your person the certificate that proves you have passed an official priof's exammation

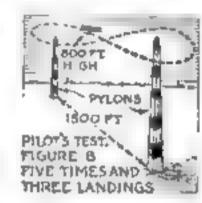
A SIMPLE test in all that is recorrect for a "private part a license—one who flies for pleasure, not for pay. In figure 8's, you citele two pylons and make several landings. Then a written ex-

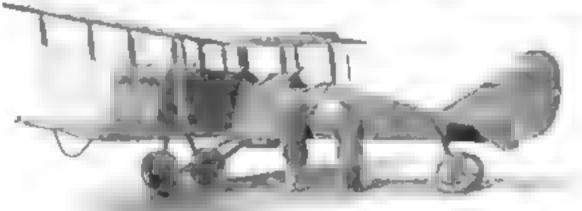
named the process you know how an air plane engine works that a page in distress at right fires a succession of Very lights, that a scapiane alighted in a fog must use a foglioro. Tour test is less severe than that for "industrial pilots." who carry commodities, or for "transport pilots," who carry paid passengers.

Now you may fly, but take care that you observe the "rules of the road." See that plane about to cross your path, just charged from the white cloud bank on your right? You must want to let him by, he has the right of way. A moment, and he is past: the "road" is clear. There is no speed limit, Half a mile be-

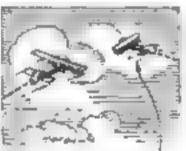
low, the ground flits beland you as you speed along to the accompanies of the rouring motor, drinking in the thrill of riding the air. Without warning, a plane

REGISTRATION NUMBER LETTER DESIGNATES CLASS OF PLANE





Appliant No. 1. first plane licensed by the U. R. Department of Commerce under the new sky traffic cules. The plane is for Government use and ' N. in the nationality mark of the United States in distinguished from other nations. The identification plate, which the two men are examining, must be all planes ' be affixed to the foreign in a priminent place. The sketch at right above shows the ' private prior i license test other shetches, above and below illustrate new Unific rules for surplane pilots.

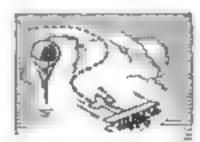


EACH PLIGHT

PLANE ON RIGHT~



ANOTHER MUST PASS ON RIGHT AND KEEP 300 FT. AWAY



BALLOONE MAVE RIGHT-OF-WAY OVER PLANES. PLANES MUST TURN OUT

thunders straight toward you out of the nest ahead. Coolly you awerve to the right, and post him.

Now you are overtaking another craft the letters on his tail are easily visible. Pull over your raider, alarply for you must give him plenty of room as you pass on his right—at least 500 feet, the regulation is. He might strike a treacherous air current and he hurled against you if you were near him. Throttle wide open, you go by, leaving a semicircle of exhaust smoke around his plane.

You decide to after your course. You turn to the left, dive through a cloud, and swoop down to a lower level. There,

almost henceth you, is a field black with people and incel with parked cars. Don't pur below a thousand feet; that's the safety land for an open-air crowd. A balloon ascension is in progress, the balloonst has just left the ground, and is

wobbling skyward in his spherical slop. There out as you approach him, the rightof-way is his.

A GRACEFUL your days flight, Home again, there is one thing more year must do. In a log that you keep for the parpose, make a brief record of your flight, Every three months s i will send a duplicate of this log to the Secretary of Comracree at Washington, It must contain, also, notes of any repairs you have inade on your plane, of the engive a rounting time, and of the result of the inspection you are responsed to make before each flight. Thus the Secretary has at hand the condition of every becaused plans in the country.

latke an antomobile, every place
mobile, every place
must now be registered and carry a
becase number. Huge
figures painted on the
wings, and rudder
serve as becase piales
and are visit to from
shove or below and
from either side. A
letter prefix agrifica
the airp age it class.

P" indicates a private craft, flown for pleasure; "C" designates a commercial plane, while succraft owned by states or this are marked with an "S' 1 S Government planes carry special letters, according to their department.

So an air pilot nowadays may lose his because because someone "took his miniber" If he violates any of the air traffic rules, his certificate may be suspended or taken away. Any passenger, or a Department of Commerce official, may demand to see his license at any time. These are a few of the new rules that are intended to make it safer to fly than to ride in an automobile.



Where men's uyes heng by excel threads! Lining a 400 four exacts in New York City from a scaffold suspended inside

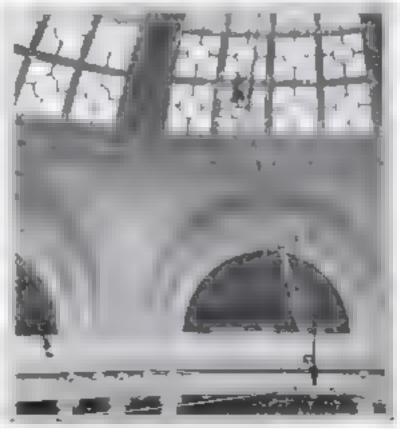
Marvels of Modern Scaffolding

How new steel-swung "trapezes" remove limitations to building construction and add thrills to worker's job

By ORVILLE H. KNEEN

AN you imagine how it would feel to do your day's work atauling on a swing og senflikt forty stories move the ground? Probalay not Neither could I until a k w weeks ago, when I determ ned to find out what it would be like, Hoisted, by permaning of a friendly sky seraper foreman, up through forty stories or so of steel. I choosed gargerly out upon a narrow board walk of two-by-ten-meh planks, and crept to the edge. I prered over the bruk a fraction of a second—and tien hurnedly grasped the fron guardran.

Straight down, five hundred feet below, lay a ribbon of cold, hard adewalk, and not a solitary thing between that adewalk and mel. If one of the planks should let go under my feet.—The thought sent chills down my spine, and I had a feeling as if a pound of lead had been poured into the pit of my stomach. I

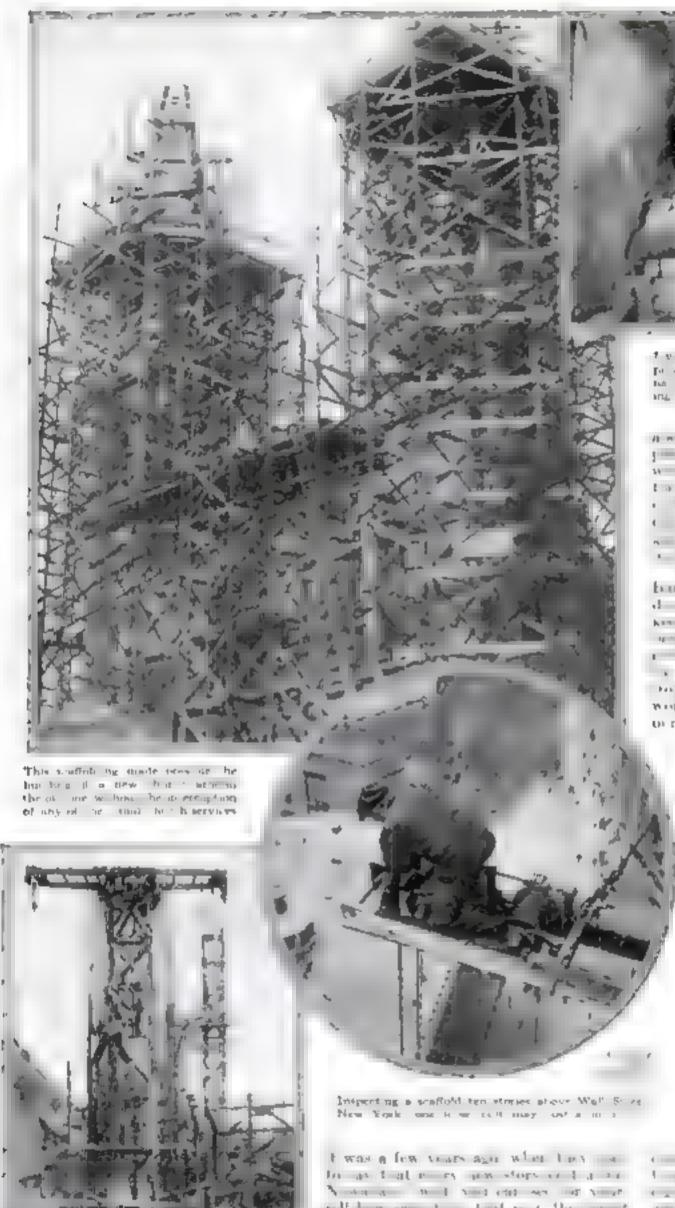


Painting the huge dome of a San Prancisco store: an ingenous cable and derrick arrangement awings the painter

drew back quekly, to look into the ever of Barney, a strapping bricklayer. My face must have given me away. He was grounds.

"Oh, you diget used to it," Le said good natured v. "We all do." We were watching the row of bricklayers and musous along the narrow walk, busny applying fiesh and skin to the nuissne skeleton of steel, and scennigly oblivious to the precipies beaneath them.

WITH the tall highlings going up nowadays, 'explained Barney, "there's hundreds of as who spend every day of our working lives on these swinging trapezes. Sure, there's aonie danger, but after a while you don't think of it except to make sure that the rigging is all shipshape. Like a circus, isn't it? Looking up at our perch from below, you'd think we're risking our necks every minute. Maybe we are—but it's nothing to what



How a San Francisco contractor speeds up work on resources chimneys: block and tackie an powerful outriggers lift the concrete forms

self I want that my a the areas DESCRIPTION OF THE PARTY NAMED IN

The rate of the base of sheet longer or record proceed a large and arms from the main structure, where they were anchored by holts and plates. For m these beams hung the scaffold platforn slung like a trapene from stout steel ware ropes. The upper ends of the ropes were fastened to the outraggers by steel shackles, while the lower ends were coiled

I wante an read back to a kuster, police on the and of the second The and a notice of the second trace t

a set to the per le partie de la constante will a month and a state of the to war of her see or as tal the acaset Mr e der e and e this is a first that the

A AS A A SECTION OF THE SECTION OF T have the public ne a new of the forth process of the second selfx > 1 or 4 a cr reopped to are Nara the viste WOLL BUT IN ALL MAN ON P. or r . V. I when the weather sacs

ten we to a lot the world to Laria II and the

I State of the second your be weren to but * color for the first or so a teral to a later long . which there is such by some file fremenant Late non-leave et al a company also pances tait us sure peasi is the safe construction of e a pres modern skywerapers a large a second a a breate by an angle a relater to regard to a gar his a second to pr sat a Mordani I I ... a to beg o talase find r stern a a tolate tion malaon face lends of the Equitable Building by forces - inter tracke appear

Not as he as a man and A Third on the state of the t para from a to a thing to profe extreme last to Dre a for proposed Larkon Tower in New Yerk to pre 10 to be a firm tears a capte of a relief a server and a figure of andmir 1 - A run differ at the man for storic gar a tite, I will the rige of pes

I snally when we think of skyscraper construction, we picture powerful steam shovels excavating (Continued on page 128)

What Does Your Garage Cost You?

Here Are Practical Hints That Will Add to Its Convenience and Reduce Expenses

JOHN R. McMAHON

UR first garage was an extra stall to a states, said the remeasing additioner "Its heating as stem consisted of the body heat given but by the livestock, which generally kept the radiator from freezing in winter. Lighting was by an or heatern being on a and. We thought it dute perfect, until one night a pair of gosts broke loose and staged a fight around the car. They summed a but deat in the copper taking of the radiator. drenched everything around with sport nig water, and wrecked both the headligates

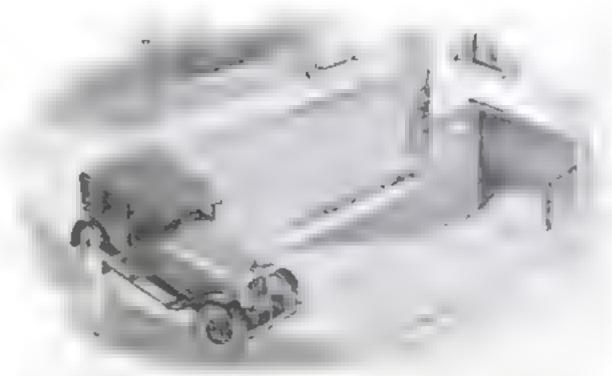
Mer that we didn't think our garage

so good any more

The first man who built a structure especially to house his car was considered subblish as well as extravagant. The idea was harder to stomach because of a queer foreign name. There was hope when people began to take sides on the tuestion whether to pronounce it garabilge or garidge.

Today almost every house has its garage. Renture adverrage," or they tell the world ghert a "toxy bone with boalt in going sometions against so for a to the time with a two terms and rage regarding the court resilies whether the house what let be at the sens whe or on a more taste and base few or many cooms. In the we may expect to see a ilders sign, "Choice garage with home at-

A CITY man or my A neighborhood or spently ing as spare hone orbiding a nome with his nwn hands He started to erect the garage first, toung stone muconcy, and now has this structure about completed. It is an intelligent procedare, for the garage will serve admirably to store but ding materials during construction and will also make a first-class workshop.



Guesges poorly located—behind the house or projecting parches in such a position that they are switwerd to get in and out of --tore much in convenience. To nave your car garden and temper, place the garage where it can have an unobsequeted drive, wethout sharp curves, to the street

On this job there will be no spoiled cement, warped hunber atolen tools or makeshift curpentry owing to lack of a convenient work place.

There are too many shodddy built, inconvenient home garages that ducourage owners from giving proper attention to their care, cause expense for trivial repairs that might be done on the premues, and fatten the purses of motor unk yard owners. Three walls, a door and roof do not make a garage. How about heat, water, light and a cement floor? Not to mention space for a work bench and the handmen of a private gas pump. It is usually a sample matter to tinker up a cheap, skimpy garage, equip it with conveniences and make it a place where you like to work; to give it an

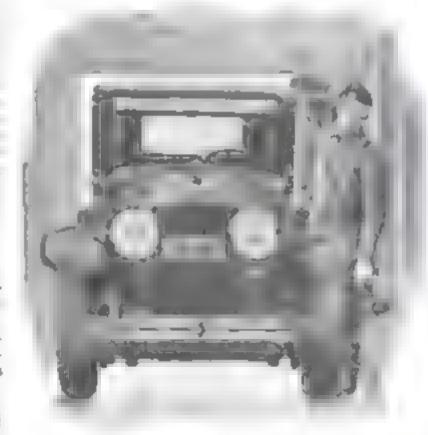
attractive outside and an inside worth showing to visitors.

What size should a garage be? An inande waith of ten feet is a tight fit, while an added foot or two or worth a es four elearance and room to get around the ear. For housing two cars, double these figures. The overall length of automobiles, bumper-equipped, varies from about twelve to about eightern feet. The latter figure will provide for any medium size car with keeway around the only,

A factor that may govern length is the type of doors. The ordinary longest doors opening outward perintt full use of garage length, while doors that fold or slide inward may require an extra foot for free operation. Height from floor to ceiling should be eight feet or better, so that the car can be jacked up enough a touring top raised, and so on. A tackie book in the ceiling waereby the engine head may be lifted in a handy detail.

Windows should be low so that light fads on machinery rather than on apholstery. In cold changes few and small wino we are desira le to save heat. There will be plenty of light in good weather with main doors open, and at other times electric bulbs will supply enough illumination. With small sash anyone can afford to have them doubte against zero temperatures. One sash may be fitted on the outside and another on the inside of an ordinary wandow frame, leaving an air space between, and the sush may be held in place with screw initions of metal. A fly screen for summer and an inner write to discourage auto-Unever are further refinements that cost http://foit.add/to/comfort.ags/security

No doubt a garage built into a house is most convenient, but it entails greater fire risk and involves more careful installation than an adjoining or separate structure. It is well to learn to advance the requirements of any local building code and those of the insurance company that handles your policy. Take



Don't build your queage so small you con't work in it. Its pier of course, depends on ground available, but an itsude width of ten feet is a right fit. An added foot or so to better

your plans to the insurance people and follow their suggestions, otherwise you may be taxed a high premium and may also do a lot of worrying over a hazardous layout. The National Board of Fire I inderwriters has assued a number of valuable pointers on the built-in garage.

and the following paragraphs are a automory of these recommendations.

N THE built-in garage, I there should be no opening through the garage ceiling. If the building is frame, make the ceiling of three fourths inch Portland cement or gypsum plaster on metal lath which weight not less than three pounds a square yard. The lath should be well nailed with aixpenny naas chacked over, and it should lap our inches on walts all around. Above the ceiling there should be standard floor joists on sixteen-meh centers and a double floor of seven eighthu-inch boards. Hetween top and bottom flooring, place a layer of anbestos or of noninflammable floor felt. The whole combranton at by no means freproof; it will merely retard a fire for a period of one hour.

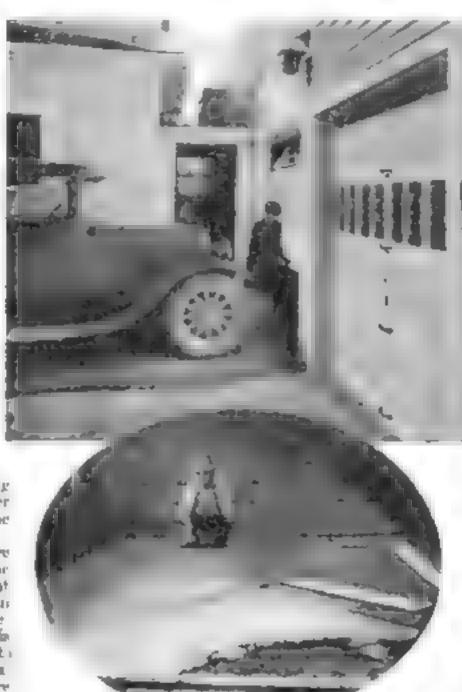
Safety can be increased by using thicker plaster and putting a layer of asbeston directly under the metal lath.

If garage walls or partitions are frame, give the stade the same treatment as for the ceiling, that is, metal lath and plaster. It is an improvement to back-plaster be tween study, whereby the lath is covered with mortar on both sides. Thus protects the metal from rust, besides adding to fire security. If walls or partitions do not embody wood, a lesser thickness is allowable; four inches for brick, hollow tile, concrete block or gypoum block, and three inches for reinforced concrete.

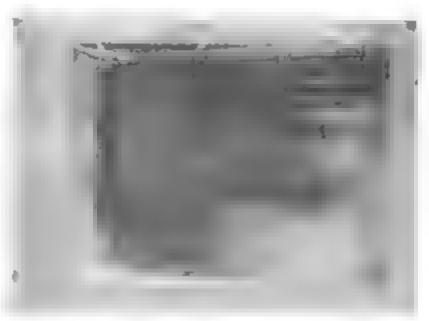
Again we must note that these are minimum, not to any skimpy provisions toward safety. It would be better to have theker misonry, or at least to cover it made with wire mesh or metaliath and plaster. A continuous sheet of metal-reinforced plaster safeguards against cracks and crumbling mortar between the units of masonry.

WIRE glass and metal framework are advised for doors and windows of the built-in garage. Only one opening between garage and house is permissible, and this should be equipped with a standard fire door of the swinging self-closing type. The door abould have no glass in it, and it should never be propped or tied open. When the doorway

connects directly with a cellar in which there is a furnace or heater, there must be a sill at least one foot higher than the level of the garage floor; or there must be a vestibule with a second door leading into the cellar. The ruised sill is explained by the fact that gasoline fumes accumulate near the ground and are checked from spreading by the sill barrier. The vestibule option mentioned above presumes that two doors will be equally protective



Have a center drain in the parage floor. You can make this by following diagonal lines, as shown here. (Upper photos An "overhead type of garage door. It is built in hinged sections that slide up out of the way on tracks



Smooth-working in-sliding doors are more convenient than out-swinging ones, and this picture, an inside view, shows how they can be made. The hinges, track and rollers are inside

against spreading of the poisonous vapor.

The floor of the built-in garage should be concrete, with a slope that will drain gas, oil and water outside. The invisible

drainage of vapor, which is highly important, will take care of itself in a fluor that is correctly sloped and equipped to carry away liquids.

Of course there should be no slove or heater within the built-in garage, unless in a compartment as secure as the rest of

the structure and having a fire door closing against a raised will. Only electric light is allowable. There is a ban against floor pits. Any gas supply beyond that in the car tank and a five-gallon can must be kept in an underground tank at least three feet below the surface.

THE attached garage may I be as convenient as the hult in, and by harmonizing sta lines with those of the house it may appear part of the original dwelling. The house roof may be extended over il. An extra room, sun parlor of alceping poreli may be built above it. If the garage is no more than a box with a flat roof, it may be ornamented with a lattice coping and with flower boxes, and have ivy or flowering vines on its walls. The actvantages of attachment to the house are obvious in

heating lighting and water supply, as well as convenient access and security against theft,

Some owners of the attacked garage prefer to sacrifice a triffe of convenience for the aske of greater fire safety, by having no direct house entrance. At the same time they save the price of a fire door, which may amount to fifty dollars.

Whatever the location or general material, every "car stable" deserves a concrete floor and concrete or purchary foundations below the front line. A proper floor can be easily evented of oil and grease with keroscie and a longhanded scrubbing beis i, it can be swept out and I ose-hashed so that the owner can inspect the moderside of his our even in La best clothes. Such a floor excludes vernue, is fire-safe, and makes it cusy to move the car by hand. It needs a six-meh base of well tamped cinders or gravel, and over this a four-inch thickness of concrete, which may have a surface finish of rich, troweled cement half an inch or so in thekness.

THE best plan is to slope the floor from all sides toward a center drain trap of east from with perforated top plate, the drain being connected with a tile line extending outdoors. This job is not so difficult as it seems. Drive sails at the height of the finished floor in the four corners, extend cords from nails to center, which

is one and one-half mehes lower. Make the cinder base conform to cord slope, likewise the concrete layer. A plank straight edge will. I (ontimed on page 1.2)

Shall We Scrap the Yardstick?

With two kinds of miles, three pounds, many arbitrary units, our measuring system is called antiquated

By ALDEN P. ARMAGNAC

Across the graticon, buried from the throats of the endets that pack the stand, comes the Multi-meter Yell. There is a history bell indit shortest football cheer of West Point's repertoire, the Millimeter Yell is manaed after a diministive fragment of a measuring scale based on a mysterious beam of red light—a scale universally known as the metric system.

When you wegs yourself on a slot machine, or stop your car to read "4 Miles to Blanky lie you are using specimens of a time-honored collection of standards that is the English system of weights and measures. Yet there is talk of changing them. Tomorrow your weighing machine may tell you that you weigh seventy kilograms, the signpost may read, "Blankytle—6 kilometers."

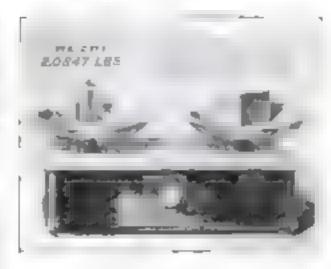
In Congress resolutions have been introduced that, if passed, would not the metric system in everyday use throughout the country. The metric system, say its advocates, is uniform, it is easy to learn and easy to use; and every civilized country but two—England and the I mited States—in using it. Shall we adopt it?

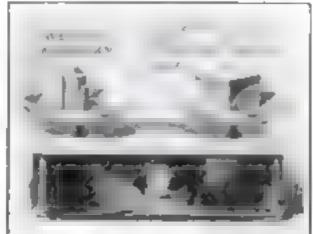
You are laden down with three kinds of weights, You use an "avoirdapois pointd" to weigh all ordinary things a lighter "troy pound" for gold, aliver and yewelst and the same pound, disgussed under the name of "apothecaries" pound" and differently divided, to measure out prescriptions at the corner drug since, Besides your two distinct miles, you have the furlong, span, hand, pennyweight, scruple, line and firkin to armoy you.

ENGLAND'S gailon and ours are not the same. The gas station attendant at our Canadian border urges motorate to replanish their tanks before they cross

the line. "Better fill 'er un-it'll cost you several cents more a gallon on the other ade." He neglects to grid that the Imperial gallon of Britain and Canada contains nearly a quart more than ours. For that matter, our yards and inches are different. It is not generally known that in 1893 the meter became the official standard of the country, and that now by law the U. S. yard and anch are redefined as fractions of a meter. For, though other units may vary, a meter is a meter the world over.

In the metric system, the meter—a attle longer than our yard is the





The metric system is easy to use because my units of volume length and weight bear the semple relationship shows above. Contrast this with the complicated decimals you get in reckning the same relationship in our Baglish system, shown in the upper picture

sole standard. Volume and weight measures are ingentously derived from it. A centimeter decimal of the meter yields the "cubic centimeter" that, with its hig brother, the "liter" measures all volumes. The weight of one "c. c.," or cubic centimeter, of pure water is a "gram," fundamental metric unit of weight.

and there you have the whole system

in its amazing simplicity. Your pound and quart are hardly on speaking terms with each other; your inch will acknowledge only a casual relationship with either. But in the metric system a given volume of water or of anything else has an instantly calculable weight and size. To a schoolbox, that means furshing his lessons in a few number, to industry an incalculable saving in brain power to be diverted to other useful fields.

MOREOVER, urge the metric supporters, all metric units are divided in tens. You think in tens, they say You do all your figuring with the symbols 1 2 3 4 5 6 7 8 0 0. Therefore, why not be consistent and use weights and measures that, like your decimal coinage, will be in harmony with this number system? It's an unusual man who can say offliand how many square feet there are in an acre; but any French schoolboy will tell you that a hectare, the corresponding metric unit, contains a thousand square meters. It is an easy figure to remember, and a handy one to figure with.

An average-sized drop of water and a plump group of wheat are the original sources of two of our smallest measures of volume and weight, the minim and the grain. Is it surprising that our scientists abandoned that system and now use the metric system for their delicate laboratory work? The chemist who makes an error of half a tenspoonful stands an excellent chance of being blown into eternity,

When it comes to measuring length, the English system as commonly used can provide nothing smaller than the mela-immediately divided into grotesque fractions such as thirty-seconds and aixty fourths. Lately, some genuses have been using decimal fractions of an inch in fine manufacturing work; but it is incongru-

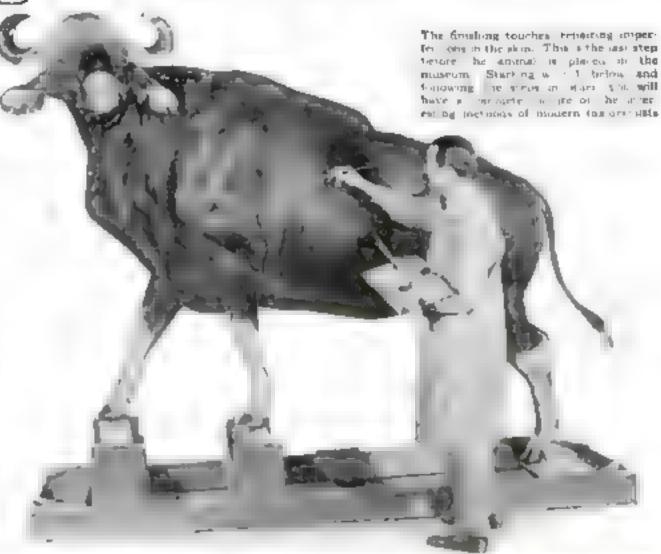
nent in feet in twelfths of a foot, and in decimals of the twelfths of a foot. In the metric system, completely decimalised, the infinitesimally small "indibination" measures light waves only a billionth of a meter long. Yet this value in written figures may be tacked directly on the end of a metric length equaling—several—anes without incongruity

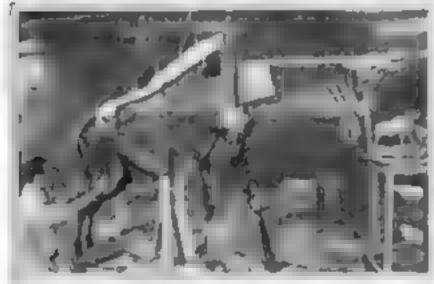
As early as 1585, Simon Stevin of Belgium pulllished a book." La Disme," in which he set forth the henefits of a decimal system of weights and measures. But it was not until footnood as page 130)

At the U. S. Bureau of Standards is kept a copy of the world's standard meter, rightly guarded at Seven, France. A group of sciencists is seen here transmissing it

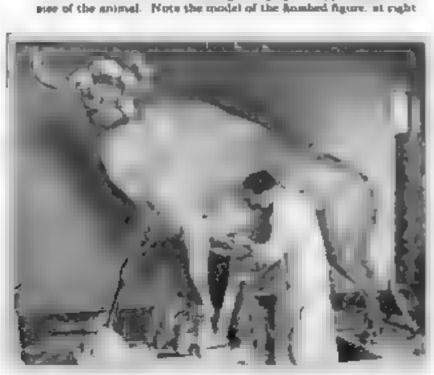
The Strangest Art in the World

How Taxidermy Makes
Animals "Live Again,"
Shown in a Remarkable Set of Photos of
the late Carl Akeley's
Methods—The Pictures Are the First to
Show the Complete
Operation and Took
Seven Months to Obtain—The Animal Isan
East Indian Wild Ox





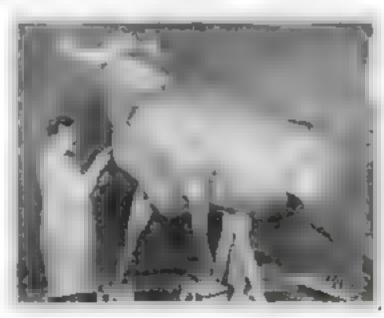
I The first arep is the construction of an "assessance" or framework of boards, using some of the animal's bones. This is then covered with wire notting, bulging to approximate the use of the animal. Note the model of the humbed figure, at make



2 Over the wire netting is then roughly applied a cost of plaster of Paris, to serve as a loss for the next cost of modeling clay. This next step, modeling with clay, is the most important of the whole process

3 'Left Apply mg the modeling clay to the planter of Puris. Beery muscle and ven of the ox as clearly emphasized

4 The finalised clay smodel at time piece of sculpture. It tooks un though all it needs in the skin but there will remains much work to be done





7 (Below) Now the isside of each section of the planter mold is stuffed tightly with a combination of fabric, whe mesh and papier maché made rigid with abellee, which forms a strong "manikin"



8 (Above) The manifels " walls," still with the plaster mold covering them on the outside are now braced with wooden crosspaces on the inside, and the services fastened together. The plaster is then maked with water to remove it from the available



I 1 The last step—clothing the reconstructed beart with his original pelt, which is fitted tightly to the hody's ridges and hollows. Even the tall and stender legs are cumually sewn up so that not a seam is discernible. Now, at last, the paor emerges in all his majesty

Bare Hands

Here is a brand-new kind of novel-A thrilling romance of ingenuity and scientific skill put to a supreme test on a desolate Arctic island

By HAWTHORNE DANIEL

Illustrated by J. Clinton Shepherd

PARKER and Thornton, partners in a Scattle engineering firm, and Williams, a young moval architect, were enjoying a pleasure cruise among the Aleutian Islands in the latter's yawl when, with their deck hand, Kelly, they fell into the hands of Kiska Jue, a notonous hulf-breed seal poscher, and his crew of native Alcuts. Undecided whether to murder his captives, Kiska Jos imprisoned them in their own yawl; then, having placed Comak and two other Alcuts in charge, he returned to his achooner. Together the two ships sailed westward. Sejiarated from the schooner in a fog. the yawl was wrecked on the rocks. Two of the Alcuts made away in a small boat, while the four white men and Domak struggled through the sea to the heach of a devolate and apparently uninhabited island. Thoraton, the natural leader of the group, managed to build a fire w thout rantches, then directed his committee-Parker, Wilhuma and Keby on the task of providing shelter in a shallow cave and of catching birds for food. Comak, mysteriously Enghtened and nervous, explained that the place was known as Devil a Island, inhabited by devils whom Kiska Joe occasional v. appeared with gifts. Later, as the men huddled about the fire, pondering their fate, suddenly there arose a weird and dreadful ery that eclosed across the cliffs, finally disappearing as mystemously as it had come. Comak, wh inpering groveled in the mand. All this was fold in the first installment published in last month's usue of Popular Science Monthly Now read on

MEY listened again for the cry, but it had gone. They eroughed close to the fire and shiverest, though they were warm. They spoke in guarded times, and glanced about, fearful lest some enemy might ereep upon them But the sound was not renewed, and gradually they recovered

their assurance and their reasoning faculties.
"Could it have been an animal?" asked Parker nervously.
"I doubt it," replied Thurnton. "I have been frightened by

boleans, and I've heard coyotes and wolves. I we heard mountain lions and a lot of other things that make weird sounds, but what we heard was nothing like those. It sounded become to me wonly terribly human. Yet Oomak says the island is amabalateri.

He pastserl

"Oh, the devilt" he went on. "Who'll go with me? I m going to see if I can't find some trace of it.

The group fell rather sheepishly quiet, until Kelly frowned and got to his feet.

"I'll go," be announced. "But I want a club.
"So do I." avantted Thornton.

But though they searched for an hour they could find no trace of what had made the sound, and so returned to the fire. still mystified. Thornton sat beside the fire, and presently found harself pondering again the difficulties that faced them.

He fried to think of elemental things which they most required, "Fire?" he thought "We have it. That's settled. Food? That's easy. Shelter? O K., until we can find a better place. Clothes? Yes, rabbits. We have lots of them. Then what?" He sat staring at the fire. "Tools," he said finally,

"Toob?" repeated Parker, "What are you talking about?" Thornton was about to reply when Williams and Kelly came tridging up with great armfuls of wood that they threw on the growing woodpile. Oomak, having cleaned his fish, brought them to the fire with a long green stack thrust through them, so they could be smaked above the blaze.

"We need took in order to live," and Thornton, returning to "And we can find them, too,

or make them-somehow

"Do what?" asked Williams, who had heard

only the end of Thornton's remark

Tools, repeated Thornton, "We have to make some. Lucu we have to get rabbats and make clothes of their skins."

How will you tun the skins? asked Wil-

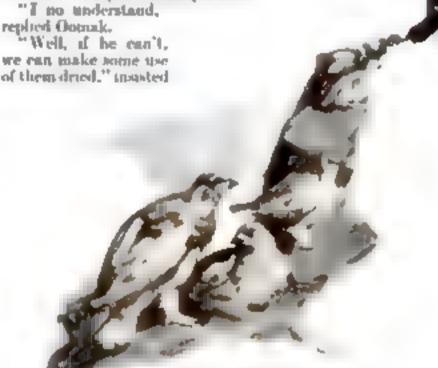
"I don't know, exactly. There is tanner in willow bark, but that a about all I know Perloops Oomak ran hesp. Can you tan rabbit skiris Oomak?

The Alest shook his head, "What you say?"

he asked.

Thornton repeated his question.

Well, if he can't, we can make some use of them deted." masted



"Now listen. It's getting late, and we'd better not get for from here tought. But we re going to get out of this fix, How, I don't know. But first we need clothes. Second we need tools. We'll start first thing in the morning to get both

Despite the fire burning before the shallow cave everyone was cold that night. But the fire at least kept them from freezing. In the morning they were up with the earliest dawn,

ready to start on their quest.

Oomak refused to leave the imagined safety of the fire and the cave, and Parker, the impractical theorist, obviously would not be highly useful on such an expedition as was planned. Furthermore, he belittled their efforts.

"Ridiculous," he sneered. "Suppose you made your tools,



although you can t. But even if you had them, what good would they do you? What we need most is the fire and food. And we ought to watch for passing ships. One will be along soon, and we can agnal it. You'll waste your time and ranneedless rake wandering about marmed. Count me out. 111 do something weful.

No one replied, but both Williams and Kelly seemed more wilding to follow Thornton's suggestion than Parker's. So it was that just as the sun rose the three started on their exploring trip. At first they planned to go together for protection, then decided not to; so, armed with clubs. Thornton took himself off up the ravine through which the stream flowed, while Kelly went off to the north along the shore, and Williams to the south

POR a quarter of an hour Thornton struggled up the narrow Reserve to an about the state of what he steep ravine. He went warny, for he had no idea of what he ni ght face. Once out of the rayine he found himself on a high and more or less tever stretch. He climbed to the top of a small hol, and saw that the island was alone in the vast expanse of sea. No land was visible in any direction, and the island itself was small hardly more than four or five unles long by half as wide. Here and there were clumps of trees, mostly along the edge of the cliff above their camp. For most of the rest of its extent the ground was covered with muss and little clumps of grass and willow. Rabbits scurned here and there. Birds flew overhead. But he saw no signs of any large animals or of men. Certainly the island was uninhabited.

It was noon before the three explorers returned to camp. None of them had seen any agos of habitation or of Oomak's devils. Thornton was the first to arrive, and in his hands were three rabbits. He found that Parker had done nothing but wonder how to creet a nignal, while Oomak had kept the fire going. But Thornton pretended not to notice Parker's inactivity. Instead, he held his publits up proudly as he came imping

back to the fire, where he sat for a time souking up the heat.

"The little ruscals. ' he said finally 'I saw plenty of them, hat I never knew how hard they were to catch

Oomak grinned as he started skinning them with his teeth. It was amazing to the white men to are how simply he performed the task. Half a dozen lutes, and he had broken the skin of the first one. He stepped it from the bind legs of the animal. and hegan to peel it off, turi ing it maide out as he did so. The skin came off whole without a break, save where he had hitten. Next he ran to a willow bush that grew a little way off brokeseveral tranches, returned, and almost in a moment had a branch bent double and thrust within the akin distending it. He set it up against a rock and began on the second radius.

"HAT looks simple." commented Thoriton, "but I doubt if you could do it. Parker

Do st? asked Parker "(B' raigse 1 coulde) da It's disgusting the way. he to tes the skip.

"It may be disgusting " replied Thornton, "but vor it be mighty glad to get a pair of pants made out of rabbit skins. There are plenty here to make

clothes for us, if we can eatch thein.

"Waste of time," objected Purker. "We li be picked up long before you can accomplish that. Did you get anything useful? "

A few bits of stone that we may be able to use replied Thoraton But there weren't meny up there. Mostly covered with grass and moss, once I got out of the rayme. There comes Williams. Maybe be has something."

Wilstams came shaffling in with one sandal nearly off, and with his arms full of sticks and stones.

Saw a seal the shouted, "but I couldn't get hum."
"What lock?" usked Thorater to return

So so," replied Williams, stopping beside the fire and droppong a strange assortment of oddly traped stones and sticks, In one atout braiseli be had thrust a sharp stone in aking a very crude axe. The other stones were of many shapes and sizessome sharp, some pointed, some thin and capable of being

Pretty good," offered Thorr ton, while Parker looked on

dar bifully

Good for what? asked Parker, disparagingly

Thornton smiled

"Good if we can't do better," he replied. " We might worry a tree down with that axe, if our patience held and the atone

He picked up a small, thin rock and broke it on another. It slivered to a fine, sharp point, and he picked up one of Oomak a fire-sharpened spears.

"You can make a spearhead out of that," suggested Parker,

despite his lack of enthusiasm.

'That's what I thought 'replied Thornton, "and that's what Williams brought it in for

Parker picked up another piece and turned it over and over. "Of course," be began, "you're wasting your time, for you won't need it, but this stone can be made into a fairly good sort. of blade. It's obsidian." He held it up to the sunlight. "You see? Where it is broken it shows a conchoidal fracture, like that of glass. If I remember correctly it was first discovered in Ethiopin in Greek times, by one Obsing, and here we find it on this desolate island. It s volcame in origin. It seems to me," he west on, "that I have read something about the uses to which savage peoples have put it. It is brittle, of course, and so you can tuse it for the tools you want so incly Stil, natives sometimes use it for arrowheads, and even for knives and mixors,"

WILLIAMS looked at Parker in surprise "Well where did you learn all that?" he saked.

"Oh, I've taken some interest in geology," replied Parker, "Never used it much, any more than you it use this obsidian, but it interested me."

They beard kelly shout as he appeared from the ing pile of boulders at their backs, and in a morsent he dropped a double armful of vari-shaped stones at their

"What did you find

Kedy?" asked Thornton, turning hopefully to the deck hand. Nothin' much,' repaid the malor. "H's swint rocky up that way. There are t a thing for a mile but big rocks that s all tumbled over. And then there as lettle inlet, and I found these almost all in one place. Lots more of the same stuff, is t there am t a sharp one in the lot. The rock am't hard enough Not much good for tools. I d say

Parker carelessly picked up one of the stones that Kelly had dropped, and looked at it. He turned it over and looked again.

"MAGNETETE," be announced. "With all the time in the world you, can't make tools out of this Obsidian may serve a bit, if we are here long enough. But not this stuff

He pitched the stone he held over his shoulder. Thornton stared at Parker in amazement. For a moment he galped and could may nothing.

Magnetite" he finally gasped. "Are you sure?"

"Why, certainly," replied Parker, teatily . 'It's an exceedingly common thing. Occurs all over the world and sometimes forms deposits important as iron ore. It's an oxide of iron Pe₂O₆, 1 believe

Thornton seized a bit of the ore and turned it over. He scratched it with another bit, and a black line showed on it

"By George," he cried, "you're right! That a wonderf it!
"It would be," replied Parker, raising his evebrows, "if the deposit were of any soze and if it were closes to envioustion. Hot as it is, it s wortaless, broad deposit undoubtedly even if the whole sland were inside of it and there's too much elsewhere in the world. It's entirely worthless."
"Worthless?" shouled Thornton springing to his feet.

"Worthless? It's everything. Now we can make real tools?"

The group about him looked blankly at his delighted face,

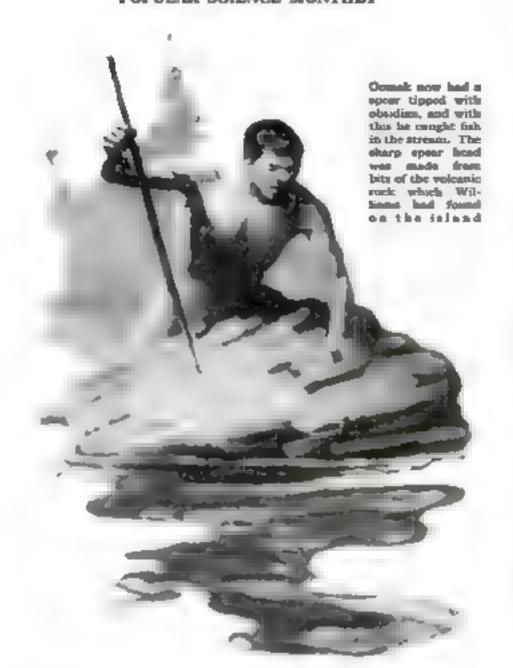
"Out of what?" asked Wilhams,

"Out of iron," shouted Thornton, "Out of steel!" He waved his bit of magnetite in the air, "All we have to do is to smell rt"

"Ridiculous," scoffed Parker

"Why? asked W lliams. "Can't it be done?"
"Of course it can be done. admitted Parker, "in a blast

formace. But we have no blast formace."
"Then by George, we'll have one!" shouted Thornton. "Iron. Steel! And watch me make tools!"



"Toenmyrot," insisted Parker.

Theraton's excitement over the discovery of the magnetite communicated itself to Williams and Kelly, although Parker still jeered

"Ridsculous," he repeated. "Perfectly ridiculous. You'll sweat and labor and fume and accomplish notic-

"Don't be so sure" replied Thornton. "Do you mean to tell us that we can t do what any number of savage tribes can do? Do you think for a moment we can't smelt from as well as the Masar and Kikuyu and other native tribes in Africa? They make spears and swords from metal they smeit themselves. If they can do it, certainly we can make axes and knoves and other simple tools."

"NONSENSE," object "Don't try to tell me that African natives ean reduce iron ore and make their spears. They are probably made in Sheffield and sent out to African trading posts. It's redesilous to suppose that anymges have enough knowledge and mechanical ability

to perform so complicated a task. I for one, don't believe they ever did such a thing."

That a merely another of your theories. Arsisted Thurnton "If you laid ever interested yourself in such matters, and had ever gone through a really time muse on the American Museum of Natural History is New York for a studge or the National Moseum in Washington—you would know that you are wrong. I have talked with men who have studied the ratives, and I know just how they reduce their are and work their metal. And if I didn't I could work out methods of my own The brouble with you is that you restare a laboratory and all the equipment in the world before you can think of attempting so simple a task as smelting from ore

He turned from Parker to the others.

"What shall our first mon tool be?" he asked

" An axe," replied Williams.

Thornton smiled and shook his bead

"Wrong," he announced. "It will be a hammer."

Parker laughed merastreally

"A highly important too: he remarked, "to go to so much trouble to secure

DUT Thornton paid no attention to the remark. He realized 15 that his own viewpoint and Parker's differed sharply. He knew too, that they were likely to be logether on the island for a considerable time. His experience in the will Is had shown nonthat sharp divergences of opinion some nors because almost unhearable. He knew even of instances where men had folled their best friends in sudden fits of inicontrollable temper gradi ally aroused by long deagreements over tribug matters. But Parker, he knew that no conception of such serious diffic it ies. and probably would continue to be biting and sareastic, dernive, macking. Therefore, Thornton thought, he himself would have to carry the major part of the barden, would have to be forbearing and considerate. Already he had given way to anger and direct speech. He must be more careful, and more considerate. It was not Parker's fault that he was a misfit in their present predicament. He was a highly specialized creature intended for and very successful under the conditions which, until now, had always surrounded lum. So Thornton paid no attention to Parker's sarrasm, and explained his viewpoint to Williams and Kelly

"The first tool we manage to make," he remarked "is bound

to be crude—that's to be expected." "No doubt about it," interjected

"And so," went on Thornion, "we want to make one that will be of some use to us in making the second one a more finished product. For that job, nothing could be more useful than a hammer "

"Right," nodded Withams. "Quite

right.

"THEN what?" asked Kelly "Anything," replied Thornton. "Axea. knives, fishhooks, spearheads, arrowheads, adzes—we'll need asizes more than anything clse if we have to build a bout.

"Baild a boat?" asked Williams. "Why not?" asked Thornton. "With tools and nails—

"Sure enough" adoutted Kelly "We

can muke hans."

"Certainly, if you can make anything sneered Parker, "but don't you think that before you make all these tools you had

better see if you can get the iron? I have now doubts. It really requires a blact furnace."

"Then we start at once making a blast furnace," consted Thornton.

But the blast furnace was not so easy to build as it at first seemed. It was not difficult to erect a chomneylike structure five or six feet high, nor was it troublesome to line it with clay. taken from the stream. But some apparatus had to be constructed to force air into the base of it, and in order to make hellows, skins were required. Furthermore, the whole party was beginning to suffer from the effects of cold, and it was obvious that akins, for clothes and for bellows, had to be secured before the other work could be continued. And that took time,

For the next five or six days Thornton, Williams, and Kelly hunted for rabbits. They built deadfalls, and utilizing sinews that Comak had cut with a bit of obsidian from the three rale. hits Thornton had caught earlier, they made snares. They even killed a few of the little animals with rocks. These they turned over to Comak. He skipped them with obsidian knives. He deted the skins on bent willow branches. He prepared still other

surews for at il more sources. The skins were dried, smoked, acraped and crudely tanned with water and pounded willow bark, and finally Comak began to sew them together with needles made of fish bones and with sinews he had pre-

pared for the purpose.

Devoting their entire time, as they did, to entching and killing rabbits, the three hunters brought in skins by the dozen, and soon by the score. And they needed to, for Onnak required forty skins for a costume. Still, at the end of the fifth day the Aleut gazed about at the collection of skins and agreed that no more were required.

The costumes were not beautiful, for Comak made them with fur turned in. But they were comfortable and warm—almost too warm for all save Parker, whose activities were impried phriost wholly to watching the blaze. In addition, sandals made of rabbit skin with the fur turned in, and with pieces of bark for the soles, made it possible for the whole group. to wander about more or less heedless of stones.

The food problem simplified itself. Practice increased their skill in huntrng ptarmigams, which they chased across the rocks and killed with Oomak now had a spear tipped with obsidian, and with this be caught fish in the stream. Rabbit

Next Month!

FIRE-SHY

EDMUNDM.LITTELL

Those of you who enjoyed "Midge" in our March issue will be thrilled by this new short story by the same suthor. You'll recognize some of the same steel-hardened, lovable characters to new and tensely dramatic aituations.

meat became excessively plentiful, and Comak, in what few spare moments he had, dried it and spicked it and piade supports of branches from which the meat was hung. Obviously they would not starve, but could they, with no more to and them than they had, supply themselves with metal and so make the huge step from the Stone Age to the Age of

It was not until they had dressed themselves in the raidot skin clothing that they finally went to work, once more, on the blast furnace. The stone clumney, which was the furnace, already had been completed, and now it remained only to construct the bellows. Thornton recalled having seen pictures of bellows used for smelting by the natives of Africa, and set about to duplicate those sumple affairs, They brought clay from the stream, damped it on the ground about the furnace, and molded at into half a dozen beavy, bowl-like contrivances, with thick walls six or eight mubes high. They

nunched two holes through the walls of each of these howls one on the side toward the furnace, where they made a clay pape by covering a round stack with clay and then withdrawing the stock. This pipe led to the wall of the furnace where a hole through the stones allowed the pipe to pass. The second hole was nomewhat larger, and merely led through the wall of the bowl, being covered on the inside by a flap of rabbit skin, one edge of which was pegged to the wall by twigs. Across the top of each of the bowls, which was hardly more than a foot wide, a loose covering of rabbit skin was featened. By alternately lifting and pressing down on this loose covering, the air was drawn through the rabbat skin valve and expelled through the clay pure into the furnace are melies above the bottom of the stone wall,

OU amuse me," announced Parker as he stood idly by, I watching Thornton pumping away at the first of the bellows to be completed. "You can't get pressure enough with such a contravance to melt butter, much less ore.

'You don't need much pressure for a furnace only five feet high," replied Thornton, in an ecociliatory tune as he could assume. "I'll bet we can make it work."

"Hasph," grunted Parker. "What fuel will you use?"

"Charcoal would be fine," replied Thornton, "but I'm not sure I know how to make it. So we may have to use wood."

"You can't use wood," objected Packer, "It won't work. You have to make charcoal. It is not difficult."

"How does one go about it? "Perfectly simple," explained Parker. "I've often seen it made by the crudest possible method, and I ve made it myself in laboratories. One method I have seen used in Europe, and which dates back to a very remote period, consists in piling billets of wood on their ends to form a conscal pile, openings being left at the bottom to admit air, with a central shaft to serve as a flue. The whole is covered with tust of moistened and. The firing is begun at the bottom of the flue, and gradually spreads outward and upward. The sucress of the operation—both as to the intrinsic value of the product and its amount --- depends upon the rate of combustion. Wood becomes brown at 220 degrees Centigrade. Charcoal made at 800 degrees inflames readily at \$80, but if it is made at a higher temperature it does not fire until heated to about 700 degrees. Therefore, for use in smelt- (Communical on page 110)



" You don't need much wit

New Wings for Your Voice

How improvements in telephony, telegraphy, radio and other mechanical methods of transmitting ideas are adding convenience and safety to modern life

By ROBERT E. MARTIN

TAND by ' Something is wrong in the submarine's whirring in terior. Despite rapid fire orders and skufal maneuvers, the tase of the steel porpose slowly settles, until it points straight to the depths, and only the tip of her tail remains above the Walves.

Twenty-eight seamen, fighting for their lives, forge the first link of the cham of communication with the outer and upper world. A floating bliov is released, carry ing an electric hell which rings lotedly and continuously through the long bours of the day and the following night. At last a steamer is alleacted by the socooning bell in misl-Atlantic tapping on the half reveals life with a, and soon a bole is dilled through the steel, admitting a correct of compressed air whalt clears the stifling interior of the under-sea boat.

Now urgent SON signus spread through

the ether, hour after At limit a peliculbay rate him the call, relayant to the Naval station. Instant v the Navy Apreligis arto action 🧸 telephone and telegraph vibrate with orders. From the hridges of destroyers signals pass to engine rooms, human voices command and respond. communication in made through a telephone attached to the buoy, and a few hours later twentyeight wenk sailors of the depths emerge through a roughthrough the air and at its destination. almost perfectly reproduced Pactures, drawings and we then documents can be hurled across the Atlantic by means of radio or across the continent by telephone or telegraph wire.

And these wonders are only samples of what the future holds. In England, for example only the other day, an image of a moving model was sent nine miles by radio, with reproduction ever enough to pidicate eventual agreess of television.

Vigano bearing of invisible light? ultra violet gavs which human eyes cannot see, were used recently no corrier waves for nection pictures in an unusual experiment performed by Dr. Donaid C. Stockberger of the Massachusetts Institute of Technology, Thrown on a special screen, the pictures glowed with a pale greenish light. Over these same invisable rays music has been broadcast

and received with an ordinary radio set, They may be used eventually Dr. Stockherger sava, for glazelem automobile beadlights. The projected rays from apparently unlighted lamps would cause roads and fences painted with fluorescent

aubstances to glow weirdly

It seems almost meredable that such mastery of the secrets of vibration, bringing a new era of communication, should have been accomplished almost within our own inferences, especially when you consider that for thousands of years men have been endeavoring to develop better was sof transmitting their ideas to others. Nature began the process by placing in the human throat a sound producing tistrument, and in the human head two sound-receiving mateuments. First man learned to vibrate at will the pair of muscular resdake leigen producing a gattural noise. Then, with Lps, nose,

throat and tongue, be learned to moduat the tasse into sound vibrations replied a 41 meaning. These sounds,

> a solid substance auch as wire or wood, impressed themselves on the eam of others and through nerves and brant were convert ed atto more or loan egravalent ideas.

> BUT man's strag-gle for exist ence soon required an extension of this mouth to-cor remmuneration of words and thoughts. He learned to relay the call to arms over hundreds of astes by deep-toned war drams. Centuries ago light waves were found useful for signals, by achograph and beacon fires. The signal bills of the Romans, sume of which were artificial. may still be seen to thus day

With the diffunion of knowledge that followed the invention of type printing came the demand for more



burned hole to air, sunlight and lif-

MIIS actual expense of the U.S. submarine Sorist a store a rather of of how effectively I am a second hus established communication interrogthe minds of men Tanny the war of radio, sound, light and make to the with meanages intelligible to the human senses, surge across the air. the sense it the land, linking continents for there

Today, by telephone, from virtually any state in the Union via have tale up any station in England, Scotland or Wales, and in one littleth of a second your voice will be carried over \$500 miles. of and and sea to the listeners' home. Your photograph can be sent miles The "light organ" with wh b Dr E & Free left , and Dr. Normen Hilberry play tunes by d recting light WATER OF YELFOOD INtensities on s photo-electric call

Dr. D. C. Stockberger of the Manachmetta Institute of Technology conducting his experiment in which music was conveyed on invisible rays and made audible by means of a radioset. by causing them to fall on a photo-electric cell substituted for detector



War drums, bescent fires, post riders, all these were but a prefude to our modern marvels of communication, the latest of all, telephoning from America to Enguand, in .018 of a second. The three phones show the main links in this artificial, write bridge. From the main control board at Rocky Point, L. I. center, the voice openin across the control from the across traph. At left, battery of powerful transmitting tubes

rapid exchange of ideas. Within the last century communication has been revolutionized. It was only yesterday in history that post index and Paul Reveres carried messages over the countryside. It is only ninety years since Morse created the telegraph, and only stity-nine since Cyrus W. Field tied two continents together with his cable under the Atlantic

From the sending of signals by electric wires it was a short step to Hell's telephone. And then men conceived the idea that electric waves, as well as sound, could be sent across the air. The nine-teenth century was just coming to an end when Marconi, from a liner sixty nules at sea, sent through the ether his famous code message. Two years later, wireless code signals spanned the Atlantic.

And now latest marvel of all—with trans-Atlantic telephone you may converse with your friends across one seventh of the earth's circumference, athough as yet there are a number of bantations. For one thing, such a

conversation will cost you at the rate of \$35 a minute. A recent twenty-eight-minute. "gossp" between two women, one in New York, the other in London cost them \$700, while in one six-minute call, a London business man held eight conferences with American associates for \$150.

MEANWHILE a thousand improvegraph have made distant communication almost as simple a matter as face-to-face conversation. For instance, when you send your voice over miles of wire, instead of beroung "tired" and weak on the journey it is strengthened every mile or so by a tiny "loading coil," which revives the electric currents and sends them on their way with renewed energy. For long distance conversation, repeating stations, every hundred miles or so serve as relays.

Moreover five separate conversations now can be carried over a single circuit by means of high-frequency currents. Even more amazing are the "mechanical brains" and electric fingers at the central exchange, which receive your call and automatically connect you with one party out of tens of thousands.

One of our great rai way systems, of 12,000 miles, now in operated outtrely by the voice of the telephone. In large stations the stentorian voice of the announcer is replaced by loudspeakers. At a single tower in the Grand Central Terminal in New York, Bell and automatic telephones convey orders the telephones convey orders the telephones transmits written schedules, loud speaking telephones, lamp aguals, bed and menators, selector telephones and similar devices enable the public to travel safely, quickly and cheaply.

The telegraph, too, has grown far afield. With the new metal permalloy, one hundred times as responsive to magnetism as the softest iron and maximes as fast in transmission, we save much of the inetal formerly needed for cables. Our underwater electric spiderwebs today (continued on page 158)

Hints for Radio Beginners

Do You Ever Forget Switches?

How to Simplify Your Current Control -Other Ideas

I RNING on and off the filement switch on your ratio receiver is all that is necessary to put the set into operation and stop it again if it is run with a stornge battery to light the filaments of the tubes and with dry cells to supply the B-battery current.

The introduction of trickle chargers and B-chainsators, however, has complicated the problem. Unless you buy an automatic relay switch to take care of turning on and off both the trickle charger and the B-chainsator, you will have at least three switches to throw every time you put the set into operation or stop it. And if you occasionally forget to turn on the trickle charger when you get through using the set, the A-battery will soon become discharged.

The diagram on this page will show you how to rig up a switch that will do all the necessary switching with one throw of the lever.

You will note that when this switch is thrown to the left, the filament current

to the set is cut off and the connection to the B-climanutor also is broken, while the cur rent is turned on to the trickle charger.

Even if you have to purchase the switch and sockets, the cost of this current control switch will be low. The switch and sockets can be mounted on the under sale of the radio table.

Testing B-Eliminators

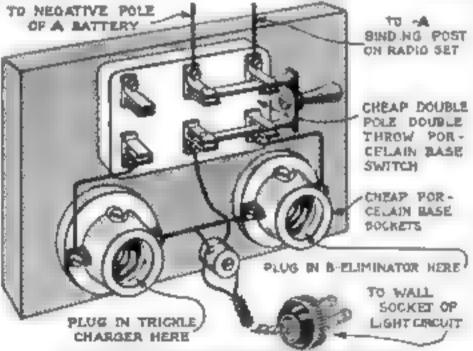
D'IN'T try to test the voltage developed by a B-hattery eliminator with an ordinary type of voltmeter. It is impossible to get even approximately accurate results in this way, and you may fool yourself into believing that the detector and amphifier stages

of your radio set are getting the proper voltages when the pressure actually may be far too high. The reason for this is that the voltage developed at any binding

post on a B-eliminator of the conventional type depends on how much current is being drawn from the eliminator

If you connect up a voltmeter to a B-eliminator while it is being used to operate a set, you will notice an immediate falling off in the volume. This will be due to the drop in voltage caused by the flow of current through the volt-

Test your bettery organismally to see if your trickle charger is brepaid 4 is good condition.



A switch and socket arrangement like this will prevent forget ting to turn on or off the trickle charger and the B-climanator

meter. If, on the other hand, you attempt to test the B-eliminator voltage while the radio set is disconnected from the eliminator, the voltage will read too high.

A B C's of RADIO

THE old method of reducing volume of a radio set was to cut out the last stage of audio amplification; and consequently most old etyle sets were provided with jorks, so that you could plug the loadspeaker into eather the first or second stage as required. The development of special power tubes for use in the last stage has changed all this, so that the best practice now is to keep all the

tubes in the audio amplifier end of the set working at all times and to control the strength of the signal before it is fed into the audio amplifier

There are several ways of doing this, perhaps the simplest being a rheostat control of one or more of the radio-frequency amplifier tubes. Practically no loss in the quality of the agnals received is noted when this type of control is used.

Special meteer suitable for testing the voltage of B-eliminators are available, but they are rather expensive. To adjust your B-eliminator, first make sure that you have the correct C-voltage.

Test Battery Frequently

THE popularity of the trickle charger, either as a separate piece of again ratios or as combined with a low capacity storage battery in the form of an A-power unit, has had an effect on the amount of testing that is needed to make size that the storage battery is charged sufficiently linklead of having to test the battery once every week or two, as is required when you charge the battery with a full rate charger, you need test the battery only often enough to make sure that the trickle charger is keeping the battery in a sufficiently charged condition.

It is desirable that the battery be tested every two or three days after it is first installed, and if you find, after several days or a week of use, that it is

still fully charged, you can be sure that the current put in by the trickle charger more than balances the smount used up by the set.

A floating ball type of hydrometer is excellent for such tests because it can be read so easily

Grid Leak Affects Tone

NOW that the grid condensers used in most radio sets are so carefully inside that there is practically no leakage of current directly through the condenser itself, radio fans are in a position to determine the effect, on both quality and volume, of changing the grid leak.

When you are using a tube of the 201A type, you will find

that distant weak signals come in with greatest volume if you use a grid leak of very high resistance. From five to more megohus is about right if you want to

get the last mile of distance. On the other hand, a high resistance grid leak is not so good on powerful local signals. Distortion spoils the quality as soon as the volume approaches even a medium high level.

For best results on powerful local signals, use a grid leak of about one half megohm. The detector tube wid stand a lot more volume without overloading.

How Broadcasting is Improving





broadenst dies tors and others are working on plans to noncove the quality of raiso program is

Peration to the same of a range and for the same of a range of the same which have resulted in the superoved quality of broadness, person, Also, the with spread public.

acceptance of radio and the intense composition between the various broadcasting atalogs have resmed in constantly in-

proved progenuss, Radio broadcasting has long since passed out of the experimental stage. Today the tracemitting room of any large brondrasting station conveys a definite impression of solidity and permanence. The modern more transmitter really is a specialized type of power house. that transforms are vibrations into osculating electric currents, amphilies them to an almost unbeseva-ne extent, and then sends them out by way of the auteura to mulious of listeners. And along with the immase in power and permanence of our broadcasting stations, biere has been a vast improvement in the furthfulness with which the misse and visices are put on the air

This improvement in quality is most noticeable, perhaps, in the programs that are picked up by interophones at some distance from the broadcasting studio, largely because there has been more room for improvement in this type of broadcasting

EARLY attempts to broadcast acts or scenes of musical comedy and opera productions direct from the stage produced weird results. If the tenor, for matance, happened to be near the microphone, his voice came through with a power that caused the loudspeaker to go off into a nerve-shattering rattle; while the voice of the soprano standing on the

other side of the stage resembled the feeble chirps of a canary.

What we may expect along these bues in the future was strikingly demonstrated recently when the chain of stations head ed by WEAF and WJZ broadcast the famous "Garden Scene" from the opera "Faust" direct from the stage of a Chiengo opera house, Listeners were

The modification at W/S, which permits the engineer in charge to study the modulation and given visible evidence of incorrect adjustment.

amazed at the fidenty of every part of

the musical reproduction.

are if I mut. the sea

Fay Leone Faurole, general manager of station WABC, recently expressed the opinion that because of the improvement in the quality of the tones reproduced, the day of freak stants in radio is over.

"In the early days of broads asting," he said, "it was a job to fill our program. All sorts of novelties and freak stunts were put on to vary the monotony of a program made up largely of phonograph records.

"IN THOSE days, only a few years ago, nobody worried much about echoes or resonance, because the transmission was poor anyway. Then better merophones came into use. Modulation was vastly improved. In order to eliminate echoes and resonance, engineers fitted studies with so much sound absorbing drapery that the transmitted music was dead and lifeless, but I expect to see a considerable improvement along these lines in the future. We have found that a certain amount of resonance is desirable. It adds naturalness to the tone quality of the music or the human voice. In fact, our new studie was designed with that point in mind."

In large measure, the stendy improvement in the quality of programs is due to the fact that advertising is footing the bill. And the broadcasting stations, in striving to get the business of the advertisers, have come to realize that listeners won't follow an evening's program, even with one or two high grade features sponsored

hy advertisers, if the rest of the program isn't worth listening to.

"We have been practically forced," said the manager of a prominent Eastern station, "to contract for high grade features that we pay for ourselves so that our advertisers will feel that they are in good company."

OTHER stations accompash the same result by employing as staff artists, entertainers of meh exceptional ability that the studio staff is capable of putting on a program equaling the special features in quality.

You and I and the rest of the millions of radio broadcast

I steners get the ben efit of all this daxgling array of talent without a cent of expense. Many readof Popular 반호하 SCHENCE MONTHLY. however, Lave expressed a fear that the rapid development of the chain station idea—whereby the actual performance before the nucrophone is sent out by wire lines to many other stations. so that all the stations transpot the Asold Diogram Almultaneously — will not work out well for several reasons.

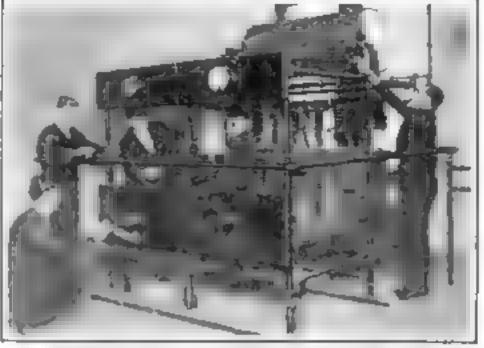
Suppose we don't happen to like the part cular program the chan statums are broad casting, what then?"

writes one reader. There would be cause for worry on this subject if the Government controlled broadcasting and if the programs were paid for out of license fees extracted from the listeners, as is the system in many foreign countries.

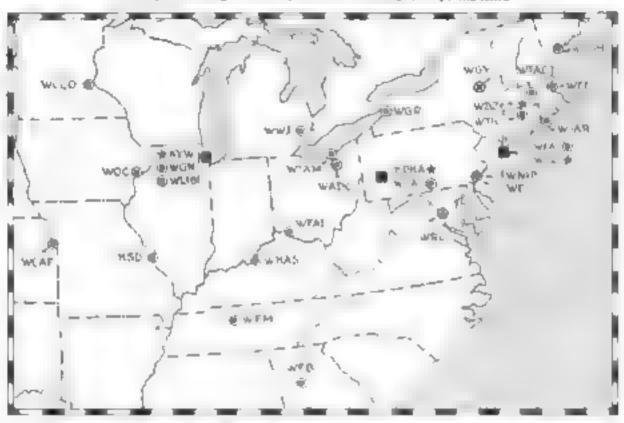
But such a attention will not arise in this country, for reasons that appear at once when you study the requirements of the advertisers who pay for the programs. An advertiser who sells his products all over the country naturally wants to build up good will by means of a china of stations that will reach as many people as possible. But there are other advertisers who want to reach just one section.

THE big chains of stations, headed by WEAF and WJZ, will take care of the first group, while stations like WABC in New York and similar stations in other localities will supply the demand for broadcasting in a specified area.

Improvement is also promised in the broadcasting of all special features not considered part of the regular program. Verbal reports of sporting events, for example, will be much clearer owing to improved methods of picking up such features and transmitting them to the main broadcasting studio.



This modern, high power transmitter in one of our large broadcasting stations, gives an impression of solidity and permanence



Development of simultaneous broadcasting by a chain of stations secure good programs to everyone. The chain headed by WIX is represented by stars, that headed by WEAF by dotted circles. Ultimately every section of the maintry will be served by these chains

Early attempts at heraskasting prize fights or football games for instance were nurred by the shouts of the foresastropic-



Present-day stations are really special purpose power bosses. Betteries of vacuum tubes supply the radio-frequency energy

ing the announcer to such an extent that his words were lost completely at vital moments. In future, we are promised, the applause and slouting will be present as a background for the announcer's voice, but will not be allowed to interfere with the clarity of his words.

The development of the chains of stations will certainly help the broadcasting of outstanding events such as a special by the President of the Linted States, because with so many stations transmitting the speech you will be sure to get it clearly from at least one station

As far as exceptional features are concerned, prom-

then t advertoers are combing the country for high priced opera stars, great missionless and ether entertainers, and promise steady improvement in the quality of their offerings.

MI CII has been said and writter about soort wave transcrission and its possible effect on broadcasting a n dithe sels now in use. I tolked this matter over with Alfred H Grebe, who has experimented extensively with this type of broadcasting.

"I don't think there is a chance that broadcasting wil in the near fature be claused

to the short waves, 'he said.' At least not us til some apparently ansormorational difficulties are worked out. In the first place, none of the millions of radio sets in use today can tune-in the very short waves; in the second place, short wave transmission has at least one perpharity that repliers it mist to use for regular broadensting.

RADIO waves of from Inerty to forty meters' wave length carry marvelous distances, but they seem to pass over a large section of the country minediately surrousing the transmitter, so that betters only a few miles away may not bear anything, while other between hundreds or even thousands of notes away may bear the program with great volume. There wouldn't be much use in transmission like that except for special purposes.

Of course we expect to continue to use our mobile stations transmitting on waves lower than the regular broadcasting range, to bring special features into the studio whenever it is not possible to get a regular wave connection. For instance, a description of a yacht race by an observer located within a stone's throw of the boats is made possible in this way,"



Don't Blame Your Radio Set!

Why You Get Several Stations at Once

By ALFRED P. LANE

With 700 radio stations now up the sir, with wave lengths available for only a fraction of that number, Uncle Sem is just waking up-

N THE last few months bundreds of readers have written to Popular Science Monthly complaining about the poor results they are getting from their rules sets, and asking for suggestions to being them improve their reception. They want to know, in particular, what causes the terrife whistling posses that they hear and why they are unable to senerate the different stations.

A letter from a reader in Unitago is

typical. He writes:

"I wish you won it felt me what is the norther with my runo set hast a neer I got fine reception. I could transman large number of distant stations on any good in got and a near the static was light I got them as clear as a bed. He'd something must have happened to my set because this year I that a mast propositive to get my distant stations without a most at pleasant what tag noise. The whistle wavers at giftly in tone that keeps up to matter want I do in the way of cleans of these, buy of fresh batteries and tooking preferonsic bane.

Lately the whisting noise his strated on some of the powerful bent statues and in some cases it suo but it at it spouls the musical lies less that I confide my set doesn't seem to be aelective any more. I wo and somet mes three stations come in a Lanchted up together like boarding home hash. Please tell me what to do about it

It sa hundred to one shot that nothing is wrong with his set. Probably it is just as good as it ever was. The trouble is that there are far too many broadcast stations on the air.

PRESIDENT COOLIDGE, or his annual message to Congress, summed up the situation in a nutshell. He stated "Due to the decisions of the courts, the authority of the Department of Communication of the Department of the Department of Communication of the Department of the Departme

actionity of the Department of Commercel oncer the law of 1812 has broken down, many more stations have been operating than can be accommodated within the limited number of wave lengths available further stations are in course of construction, many stations have departed from the scheme of also ation set down by the Department, and the whole service of this most important public function has drifted into such chaot as seems likely, if not remedied, to destroy its great value. I most ingently recommend that this legislation should be speedly enacted."

Meanwhile radio broadcasting is going from had to worse, and will continue to do so notif some definite action is taken. When the President spoke, there were slightly more than 600 stations on the air. As this is written the number has increased to about 700. Each new station means just so much more squeating and howling and interference for Diousands of radio face.

The reason for the long delay from the leg seative standpoint has been. To whom should the control of miles broad asting be awarded?

O'vE group has held that rad-o should be under the periodic from of the Secretary of Commerce: Its opponents bave contended that a commission form of control is preferable This has been the chief obstacle to the charifying of the radio situation, in spite of the fact that there are other knotty problems which must be solved either now or in the near future if broadcasting is to be permitted to develop along lines that will bring the greatest amount of pleasure to the largest number of radio his-

Lestening in for just one evening will prove to anyone that there are too many stations on the air. But what is to be done about it? Who is to say that this station is necessary and that one superfluous? How are the unneeded stations to be demed the privileges of the air? Answering these questions will require much hard thinking on the part of our legislators, especially asset

radio broadcasting offers legal problems for which there are no precedents.

But after all, what you as a radio listener want to see is the air cleaned up so that you can sit down before your radio set is the evening and get clear music and speech from severa, different stations without lowing your radio entertainment raised by howing interference.

In orthogen, there is nothing that you can do to your radio equipment that will bein in the slightest degree to overcome the troubles brought on by too much broadcasting. Even a laboratory model receiver built by the most skillful radio engageer could not unit ramble the stations from the mess of beterodyne interference that is daily becoming worse.

As we go to (Continued on page (27)



With two many stations on the air at once, this is what happens to make of us. What respects will be applied?

I Catch My Wild





Wynant Davis Hubbard

For several veges We want Daris Hobbard, a former Horrord furthall player, hunted wild animals in Africa, and to hill them, but to capture them alive, train them, and ship them to American 2006. His amazing experiences, some of which he relates here, are stranger than romance more exeding than benetice busting. The ordinary African game kitting expedition seems tame compaced with the adventures of this land thrower of the jungles.

HERE Inkes a that bash See, it is looking at you. A big one Longone, one of my native black hoys, pointed exertedly to a clump of evergreen bushes. For a moment I could distinguish nothing, then suitdenly the green shadow I was looking

at took on the bideous shape of a hope python! Its supple body, coiled memoraply, looked as leg around as a man's thigh. Close by lay an or be autelope which the python had just k fied, probably by one tremendous squreae and a late on the head. Apparently we find interrupted the slayer's most.

it turned to Mangueers, my faithful pigmy gan bener and adviser

Mangineers. I said, we certainly can t eatch this stake when it is couled up like that. Do you think we'll have a chance if we trust straid make it stretch out?

"Maybe, Inkos," he said.

But I wasn't particularly confident. In several years of adventure over more I min five thousand poles of South Central Maca: I had lumlest and captured pienty of big game save, but never before had I tackled a smake the size of this one Naturally I was somewhat doubtful how to go about it. I had heard of men nessing pythous, but such a method scenied universality dangerous. For J. knew that while a python can robet a severe bite, its most deal ly weapon is its had. With this it can strike a blow that will sump a man a legs as if they were matchsticks. Thus, while noosing the stake a head tindoclived v world prevent its escape, it would also leave lifteen to thirty feet of writhing numer lashing around furnously at the ent of the rope.

"We've got to get it by the tail," I thought. And immediately a plan suggested itself. Why not use forked sticks, the most reliable catering implements may limiter can have? Quality my intive boys cot four heavy sticks about five feet long and deeply forked at one end; also a long light pole with which to poke the make. Then I outlined the plan of attack,

MAGINEERA, kaputage and Towl, I such "each of vac take one stick—give me one, too. Now, I will push the make with the pore and try to make it straighten out and move away. If it does, we four will approach quetly, and when I shout we will pro the sinke down with the forked sticks. I will take the tao. Mangineera, you take the head kaputang and Towl will be between. Do you understand.

"Yes, Jukos," they answered.



Sable antelope call cought young, shown

with Mrs. Hubbard, Trusting and friendly

these animals are very easy to raise. Pull-grown, they have home measuring

Alty inches, with which, lying down,

they defend themselves from attack



If a full-grown deepard got loose and climbed, enaring and growling on top of the monkey cage how would you much him? Mr. and Mrs. Hubbard took bold of his ten—but it was a perilous ten minutes before they managed to also his collar on! Bosco. a half grown seepard is shown here purving contentment under Mrs. Hubbard a caresses

Center above: Sirilors, the leopard used as a family pet, being sprayed to rid into of fees



In this picture, showing Mr. and Mrs. Hobbard and their two children, the explorer is ciding Yank, the six-year-old elephant whose thrilling chase and capture by the tail are described in the article.

Beasts by the Tail!

Some Glorious Free-for-Alls I Have Had in the Jungle with Man-Crushing Pythons, Elephants and Wild Boars

"But be careful." I cantioned, "Don't louch the snake until I say the word. You other boys." I said, turning to the rest of my belpers, " stay close in case something happens.

Approaching within four feet of the coded mass, quietly so as not to alarm it, I poked it gently with the long pole. If it had lunged at me, I would have had to run. But luck was with an for the big brute slow y amended and sten gatened out as it prepared obligingly to crowl-AWAY!

"Come on, Mangineers. Gently now Watch the head boy I was almost whaspering my directions. All three boys were walking stealthily alongside the slowly moving creature

I got up close to the tail. I could see "Now!" I abunded

Down came the four sticks together. The boys granted as they put their weights to the poles. I pushed with all my strength. The great snake hunched up in hunches between the sticks, trying to free itself.

I CALLED to the other natives, who had been watching open-monthed. They rushed up and we had eight more clubble ing the suppery body. Mangineers stid has bound down and found a bold just oork of the flat head

" All right, now, I ordered, "pick it

The python must have weighed a hundred pounds. It westhed and buckled I count feel the powerful back muscles flow under my grop. But fluxly we managed to stuff it into a huge sack that

one of the boys had brought. Then we tied the bag to a pole and carried our prine back to my main animal catching camp at Tara, Northern Rhodesia. There we took it out and measured it. It was exactly seventeen feet, five mehes long!

THIS straiggle was typical of countless A exciting adventures and narrow escapes which fall to the lot of the professional animal catcher. Catching dangerous animals alive is the most thrilling sport in the world. In my opinson at far outclasses hunting to kall; for et is a game in which burium with and strength are pitted against the power and cunning of wild beasts, with the chances of victory on a fairly even bans.

By odd comesdence, the only other nython I ever was fortunate enough to capture was found within a week of the first. Thus time, however, the battle nearly ended disastrously for me. Apparently the snake had just finished its dinner, for about a third down its length was a bulge the size of an antelope. That the victim had been a ram was evidenced by the horns, which projected until they almost punctured the make's skin.

Agua we came down with our forked stacks; but thes time I was caught off my guard. Instead of keeping my eyes on the danger ous tail, my attention was

Continued on suge 1.79



Brillum, the leopard, and Bendy the Great Dans, who became great friends and ate out of the same bowl



The family cut a white-tailed mongone, kept in the Hubbard kitches after its capture n catch rate and raice, which it does with remarkable success owing to its extraordinarity sharp eyes agility and lightning speed.

Center, above: A wort bog, so-called because of warty excrescences on its face, trulated and tred after its capture ready to be toted to camp



This is the wart bog whose thrilling capture, after an all-day chase under a broiling tropical min, is described to the article, being carried back to comp. Hubbard caught him, finally, by the legi-

Catching Up

New Silk from Old, Sounds Now "Seen," Other Advances



Bounds can be "seen" and the deaf can "bear," by means of the "phonoscope" the invention of Joseph W. Leng, New York engineer. The device registers the vibration of the voice by a bound of light and a small revolving mirror. In the picture Mr. Leng is spenting into the device while Miss E. S. McKay reads the "patterns" made by the vibrations

That teeth furnish over the enterior of many attended to the control of the form of the third of the enterior of the enterior

Cos the ser process of the series of the series to the series of the ser

Food Crops Increased by Science

Interest that he ways of decomposing larger and better food crops have come to light through recent scientific experiments. For example, Prof. R. B. Harvey of the University Farm, St. Paul, Miria, reports that he has speeded up the ripening of fruits by subjecting them to gas attacks with two ingredients of common city gas, ethylene and propylene. In his experiments, he mys, banaous and honeydew melons were found to be especially benefited by the gas treatment

Other tests by Dr. M. Jacobson, plant physiologist of Camden, N. J., indicate that needs subjected to mild doses of so-called "soft" A-rays produce greatly merensed yields. Potted plants from rayed seeds flowered and bore fruit from one to three weeks earlier than those from unrayed seeds, he reports, and their yield was from fifteen to 170 percent greater. Potatoes from treated tubers gave crop increases of 170 percent.

Scientific breeding of wheat, like the raising of pedigreed livestock, also is proving of great value. According to Dr. H. J. Garber of West Virginia University, farmers in the great wheat belt of Canada alone have obtained eighty million more bushels a year since planting an improved variety of wheat.

Guncotton from Garbage

POSSIBLY some day nothing whatever will be wasted. The last word in salvaging scraps comes from Berlin. Germany, where an engineer, Kurt Gerson, has recently erected a large plant to convert the garbage of the city into guncotion, artificial silk, and other useful products.

By his process, all criticione matter is afted from the garbage and subjected to special treatment. Moreover, by distilling such matter as potato partings and pieces of wood, tierson declares he can produce tar, charcoal, and acetic acid.

Voice Secrets Revealed by Camera

THROUGH the magic of photography, caperimenters are revening in black and whole new secrets of our voices, and their effects upon listeners. Recently Dr. Carl E. Seasbore of the University of Jowa, demonstrating how he makes sound waves appear before him, produced a visible ercord of a negro—blues—song. He showed that the back and white impression of the sound waves was far more reliable than trained human cars in re-

cording pitch and timbre of the voice.

From sound photographs. Dr. Seashore and others are study ug the factors that make maging beautiful and appealing. For example, they have decovered that the quivering vibrate man important means of portraying emotion in music and speech.

Prof G Oscar Russell of Ohio State I inversity recently succeeded for the first tone in making photographs of the interior mechanism of the voice. This he is bieved with a camera connected with a tube containing mirrors, Jenses, prising and a lighting device.

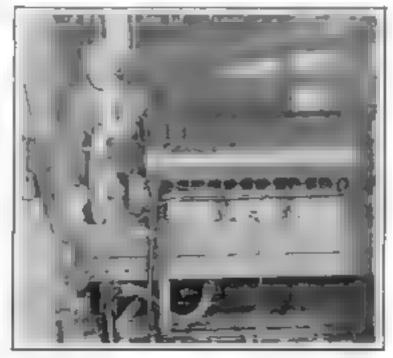
Now-the Pedigreed Oyster

AFTER many remarkable experiments, Waham F Wells, biologist of the New York State Conservation Comnussion has succeeded in raising a superior breed of oysters.

The super a ster is and to be fatter, more tasts, faster-growing and hard er. It lives in a abelt of improved design, decorated with a symmetrical pattern, and far different from the clamay, missisapen bome of the ordinary oyster. It is the result of modern amentific breeding methods, such as have produced the paper-shelled pecan, the seedless orange and countless other improved foods.

He Draws Electricity from Light

A NOTHER step toward realization of the factorating dream of obtaining power from the sun is seen in the recent success of Dr. W. W. Coblentz of the U.S. Burran of Standards, Washington, in generating electricity from light through the agency of the mineral molyb-



One of the first tests made in the new altitude chamber of the Bureau of Standards, Washington, was that of the latest Curtise 375 h.p. airplant motor, equipped with a supercharger for high sixtudes. E. W. Hum a shown making final adjustments on the recording apparatus

with Science

dente. This mineral is one of the chief sources of molybdenum, used in steel making.

Dr Coblents discovered that a crystal of molybdenite, when exposed to instinal light, produces an electric current; in fact, he was able to obtain in this way two ten-thousandths of an ampere of current. Moreover, by using vacuum tube amplifiers, such as are employed in radio, the feeble current may be magnified greatly, making the crystal available as a delicate light detector, or electrical "eye," such as the photo-electric cell.

Old Silk Made into New

WORD comes from Japan
that old silk stockings
and worn-out silk clothes need
no longer be thrown away, but
can be turned into new silk of
better quality than the origstal. A few weeks ago Dr.
P P von Wernarn of the Insperial Research Institute at
Chaka completed experiments
in which he claims to have usade
waste into threads of higher quality

The old silk rags were dissolved, then put through chemical processes which converted them in turn to a liquid, a yelly, and finally to a plantic substance that could be drawn out into threads.

Circles Earth in Sub for Science

MEASUREMENTS which may prove invaluable to accerne in studying cartingiakes and the earth a structure are being computed by Dr. Vening Memora, young Datch scientist, as the result of a remarkable underwater voyage which he recently made around the world in a submarine to measure variations in the force of gravity at different parts of the earth's crust.

At some points on the earth's surface objects weigh alightly more than at others. These differences, while too small to be detected by ordinary scales, are important to scientists as indicating differences in the density of rocks in the earth a crast. It was because the motion of a surface slup disturbs the apparatus for measuring such variations that Dr. Memess carried the apparatus undersea around the world.

Light Rays Source of Life?

IN THE mysterious and highly penetrating cosmic rays which bombard our earth from outer space and which reach us with power to pierce an feet of lead, sesence may find the source of all his energy. Such, at least, was the fascinating possibility suggested recently by Dr. Michael 1. Pupin, physicist, of Columbia University.

"The source of life energy is at present



How hard and high does your unto hump? To find out, and to test shork absorbers and unubbers, Professor Fox of the University of fows has devised an artificial set of humps, produced by a continuous treadmilt with uneven surface. In the illustration, the professor is watching the results braced to humped curves on a special seasonographists instrument.

new theory. 'We know that all chemical action is accompanied by ionization. We know that all chemical action is accompanied by ionization. We know that These rays—the so-called 'Midhkan rays'—strongly cause ionization. My suggestion is that the forming power of these rays furnishes the energy of the living cells."

The cosmic tops are many finites as penetrating as the most powerful X-rays and radium rays. Scientists believe they



Whether the steel framework of a burning building would collapse under the heat is determined by this device at the Bureau of Standards, Washington. Photo shows P D. Selt reading the amount the gader yields, subject to high temperature and pressure

come from the sun and other stars, and that their energy in released when decired particles, or cleater is, combine to form a or softmatter is reserved to exercise pressure that energy is sent flying them, is speed of light.

If l'misser t'apur's theory is correct, it is possible that tremendous transformations which took place to stars in the far distant past, milions of years ago, may today be supplying

the energy to every living cell in the amount and vegetable worlds.

Now Airplanes Excel Insects

So RAPID has been the progress in applianc design that today non-excels most of Nature's flying creatures in keeping himself aloft with wings. This conclusion is based on recent remarkable measurements made in France by M. P. Portier and M. de Rorthnya. For comparison with the lifting capacity of normal wings, they measured the wing areas of different meets, and determined the weights supported by these areas.

Mindern airplanes support weights of from two to four pounds on each square foot of their wing surfaces, some even more. In contrast, the wings of a variety of curpenter bee, record holder in this respect mining insects, were found to support a weight equivalent to only six tenths of a pound per square foot.

Many butterfirs and other insects with large wings made even poorer showings. Some of them were able to support the equivalent of only a twentieth of a pound per square foot of wing surface.

Serum for Rheumatism

"THE most important advance in medicine since tusulin" is the way many physicians had preliminary announcement of a serion treatment for acute rheumatic fever, commonly known as rheumatism. Credit for the isolation of the organism of this baffling disease and development of the autitoxia, if confirmed by further tests, will go to Dr. James C Small, chief bacteriologist of the Philadelphia General Hospital, and his staff

The First Beauty Parlor

Our ancestors cut their hair with clamshells -Some strange ancient inventions How much your dog can understand Facts about cyclones Fascinating books

"A Bird's-Eye View of Invention"

By A. Frederick Collins
Thomas L. Crowell Company

DID you know that the first beauty parlor was equipped with a pair of clamshells? Or, if it was run by "Madame" Somebody, with a complete outfit of sharks' teeth? Perhaps a sharp edged flat stone stood in the corner.

That was all that was needed in those primitive times, but with such tools our ancestors gave themselves the first hair-ruts. Then they went down to the tailor shop to try on their new suits of bark fiber which the tailor had been besting with the rounded end of a club, on a smooth stone under water.

From that day to this, man has been inventing things, always doing something a 't better than before, or doing something nobody else had done before.

That book, "A Bird's-Eye View of Invention," abounds in statements of simple but amazing facts. For example, the following

"That prehistoric man made measurements long before he had learned how to

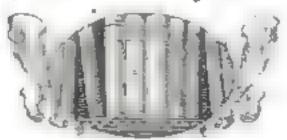
count, there is not the slightest doubt, and that he knew how to count long before he had mvented figures, is a moral certainty

Our three most indispensable tools, the hummer, the kinfe and the saw, were the first to be invented. After man had learned to saw with the jawbone of a stack or include of a fish he set a fishbone in a stick and cotated it between his palms, and behold, he had a drill! Then be split a green stick at one end, and had a vise.

MICH later, man found metals and how to use them. Long before Christ furnaces were built upon hilltops where the wind could fan them. Then came artificial wind, the first blower, a goatskin sewed up and fitted with valve and nozzle. Steel tools have been found in pyranids dating to 2500 years before Christ.

The original farmer loosened the soil with a stick, which was the

By THOMAS M. JOHNSON



original lose and until the eighteenth century farm tools were very primitive. For a long time a plow was simply a crooked branch with a pointed fork. The first fron plow, patented in 1787, was a "flop" because the farmers thought it possoned the soil! Until 1839 the harrow had not changed much from the Middle Ages. There was a great flood of useful farm inventions about this time—respers, grain drills, binders and threshers. Considering the changes of the last fifteen years, it seems almost incredible that the gasoline tractor did not really "come in" until 1903.

"Power" was ushered into man's affairs by the trendwheel, invented long before the written history begins. It was made by fixing to a shaft paddles which a man then stepped upon. A Saracen arvested the windmill, and the Crowders brought it to Europe in the twelfth century.

The first wheeled vehicle, a rough cart, was first drawn by man, its inventor, and later by a bullock. Ra frond engines and cars did not come until 1769 and did not really work until 1804. The first American-built loconsotive, the "Best Friend," burst upon public gase in 1831 and later burst in small pieces, but was soon followed by others that did not.

RAILROADING has been one invention after another. In the first block system, for instance, the engineer passed a staff from one station agent to the next, much as relay meers do. Until the staff was in the station agent's hands, no train could pass into the same block, in the opposite direction.

Did you know that the first telegraph had twenty-six wires—one for each letter in the alphabet—and that the foregunner of the telephone was the old familiar "lovers" telephone made by connecting with a taut string two cylinders perhaps

even tin caus? From such beginnings come "the most valuable single patent ever mucd," given to Bell in

The author was himself an early experimenter in radio, and his chapters discussing wireless communication, including television, are among the most interesting in the book.

"Tropical Cyclones"
By Leune M. Ches
The Macmillen Company

THIS book may help to prevent or at least to reduce the damage done by tropical cyclones, which the author has studied for thirty-seven years along the coast of the Gulf of Mexico. The result is that he has some ideas of his own that differ from those held by many.

He believes he has found how better to foretell the course of a cyclone, through the discovery that the air current in which the cyclone travels materially influ
(continued on page 143)

Trapping the Breeze Under Pull Sall

SCUDDING before the wind, its huge spread of canvan bulging like an umbrella, this unimal little salbout automaked spectators at a recent yacht race in Sydney Harbor, Australia. Although bittle larger than a cathout, it carries, heade a mainsail, a balloon jib and a flying spinnaker. The latter is set on the side opposite the mainsail by means of a long spinnaker boom. Sand is used as ballost

INGENIOUS INVENTIONS



Huge Desert Ship to Speed over Sand on Wheels

A OCEAN meet on land is the monster vehicle proposed by a German reventor and pictured in one artist a conception above. J. C. Bishoff of K. el., the designer, sees desert travelers of the fature emmarking on a land slip that surrounds his S00-odd passengers with all the hix mous comfort of a modern sea liner. Within its windowed cabins the traveler would have no fear of hunger, thirst, nor the once-dreaded sandstorm. Gigantic gasoline motors in the hull

would turn the forty foot wheels, which are rimmed with puddle-like blades to gain a firm foothold in the shifting sands. At the front of the 300-foot craft are the pilot house and steering apparatus, and from a near-by bridge the captain issues orders. At night a powerful searchight would east its beam over the sands through which the ship plows at twenty index an hour in an airling to its destination.





A Boat That Couldn't Sink-It Bails Itself

IN THE belief that he has perfected a system that would make boats unsubable, Fred N Nelson, of beattle. Wash, plans to demonstrate the model cenft shows before Navy officials. A unique self-bader designed to eject water at total traditionally from the hold, and a safety vention for sear the stern which admits air

but not water, are features of his plan. In the distration, the inventor is about to test his device by placing the model, weighted down with bricks, in a tub to see if it will float.

Lifeboats manipped with this selfbailing system would be unsurkable under the worst storm conditions, anys Nelson.

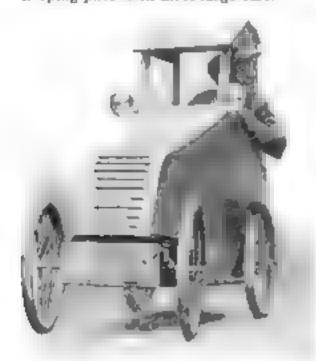
Navy Tests Oil Burner for Planes

ARPLANES were run successfully on heavy cal instead of gasoline in recent tests, and special Diesel engines, in rung this inexpensive fuel, may soon be installed in Navy planes, according to Dr. Joseph S. Ames of the National Advisory Committee for Accommittee.

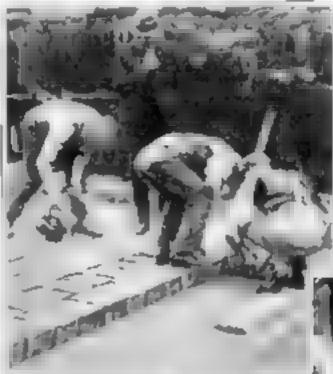
Two Feet Wide-a Real Auto!

PRETTY nearly the ultimate limit in small size for an automobile that can carry a man-sized passenger, the car below was built by Isidore Lubin, New York City mechanic. A little more than two feet wide, it threads its way easily through a mase of traffic that hopelendy ties up ordinary venicles.

The little sate is surprisingly speedy, keeping pace with most large cars.



A more slice of an auto, this—but on New York a crowded streets t has its adventages



Large a black persons on a Largebra street. At a glob list less such a motion a colors de sing

London to Have Rubber Street

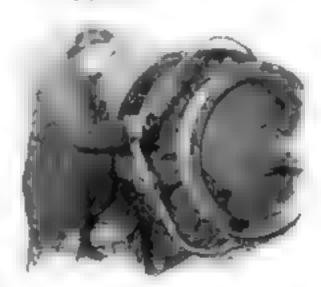
With not streets of rabber, as well as sudder automobile tires? So reasoned a Manchester, England, manufacturer at whose cost New Bridge Street. London, is being paved with rubber blocks. The heavy traffic on this street be expects, will give a conclusive test of his claims that rubber paving will reduce dust, house and the danger of skidding, at the same time proving as durable as conventional paving materials.

As used in this unusual construction job, the new blocks, one of which is diastrated, are made of terra cotta with a rubber facing. They are laid and cemented together like ordinary blocks, as shown in the photograph above.

This Automobile Horn "Talks"!

*PARDON me, but would you mind stepping out of my way?" is said to be the warning shouted by the newest auto horn, which addresses careless pedestrians through a phonograph loud-speaker. Admonished in such a manner the astonished pedestrian could hardly fail to heed the automobilist's courteous insureties.

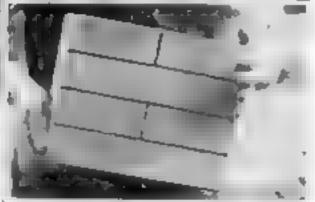
According to the new horn's inventor, Benjamin Freeble of Detroit, Mich., the same device could be used as a radical crossing guard to announce, "Trasa coming on the east track!" or "All clear. You may proceed,"



Some Calipers!

HAVE you ever wondered wheels with? Here show it schole a that on a Pack stown it schole a that on a Pack stown twick to se camers wit, on large errors. In this picture they ee he ping the up a pair of car wheels that are being turned in a special latio.

Of the car presents rated here and der in the bars of cycle has now be used to resear. I neverage to see room to cracked up, but the larger sizes are many amore than three feet.

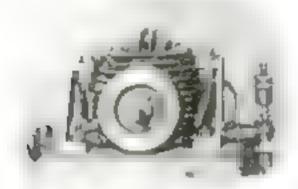


Electric Device Subs for Heart

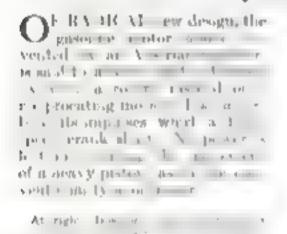
WHEN does life cease, and physical death occur? Apparently not even after the heart has stopped, according to reports of a remarkable instrument invented to Russia which mechanically takes over the function of the heart. The electric "heart" was tried out on a dog officially pronounced dead. In a few moments, it is said, the machine started up the animal's circulation again, its eyes opened, and for several hours it gave signs of life and reacted to tests for the perception of light and pain.

Radio "Eyes" for Ships in Fog

WHEN heavy fog blankets the sea and an approaching vessel might be sern too late to avert a crash, radio beams may in future automatically warn of the ship's approach, if a remarkable new device comes into general use. Dr. F. A. Kolster, inventor of the well-known radio compass, has perfected the new electric beacon, which, he says, automatically broadcasta a warning signal over a tenmile radius to other ships in the path of the oncoming vessel. Installed in the pilot house and independent of the slop s wireless, it is thensed on in loggy weather, Other craft locate the aignals and take Steps to avoid a collision through the use of the radio compans, which tells the direction the signals are coming from.



Austrian Invents Rotary Motor



h....

ti prote

to a series of



Amazing Engine Has Fewer Parts The

OF EXTRAORDINARY design, a new rods, wrist pins, or crank case, and sawl to allow twenty percent more interage to a gallon of gas, has just been invented by John A. Hosmans, of Brooklyn, N. Y. Owing to its simplified existraction, Bosmans says, its efficiency is doubled and he can take the motor apart remove the crank shaft and put it all together again in thicty minutes. The same simplicity, he declares, will decrease its cost of manufacture to a fraction of the present cost of an equally powerful engine.

Eight cylinders are set in horizontal blocks on opposite sides of the motor.



Till's parachute jumper had a few tense momenta when he catapulted from a speeding scout plane directly over the dreadnaught California, during recent maneuvers of the Pacific Fleet off San Pedro, California. A lucky wind hore

loss safely past, but at the moment that that remarkable picture was taken he barely missed the jagged spars that would have slashed his parachute and sent him hierthing to the deck far below. Fortunately, he landed safely on the water.

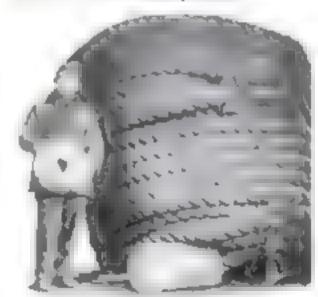
New Auto Light Reduces Glare

DAZZLING glare is said to be reduced to a minimum, in a new type of automobile headingly a evented in Germany having two reparate light bulbs, one used for a strong beam straight ahead and the other arranged to throw the light downward. The change from one type of beam to the other is made by a foot swatch

Giant Rope Weighs Five Tons

District Mass, firm of shapers, this record scena he so p's hawser, below, has to be transported in a special freight car of a size to accommodate its large hick Nearly a quarter of a mile long, the mighty cable weighs nearly five toric and measures a full fifteen melies in exemiterence.

With much ropes, gunt craft upy safely ride out the fercest gale. Ordinary supply have end every every from five to ten outles, and from 900 to 3000 pounds.



The world's biggret ship a hawter looks its size, contrasted with a cost of ordinary also drope!

There are four double headed postors, each working in two exhaders? As one exhader fires, the gas in the opposite one is compressed, and a moment later the cycle is reversed. Power reaches the crark shaft through a four-soled bearing that endes in a diagonal groove within the piston and each revolving bend of the crank shaft is entirely contained inside the bollow piston shell.

More than twice as long as in ordinary motors, the unusual piston cannot wobble as much as a short one within the evhader walls, hence it will not wear down the poston chambers and make regrinding necessary. Absence of vibration and unusual fuel economy are other results claimed for this remarkable construction.

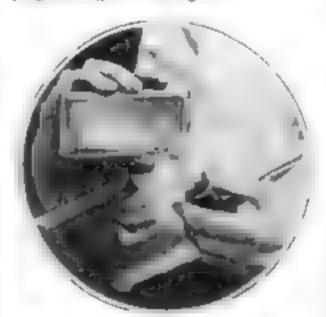
School Opens Butcher Course to Women



Learning how to swing the botcher's knife and handle his now and chopper

MODERN women are abandoning the rolling-pin for the cleaver, isdaying from this picture from the Smithfield School, Saffon Hill, London, England, where the recent admittance of women to the butchering course has met with amazing response. The young women are serious workers and soon become adept at swinging the formidable tools indicate regarded as exchangely masculate property. The course includes thorough instruction in the anatomy of

the annuals we cut, in the questions of preservation and refrigeration, and in modern butcher shop sanitation. The photograph shows women students chopping, sawing and cutting ment.



Tobacco Pouch "Pours" Easily

HERE'S an all-metal tobacco "pouch" that will not grind your pet mixture to ill-tasting dust, nor spill tobacco over the user and floor in filling a jupe, according to the inventor. A small section of the hinged hid opens to release an easily controlled flow of the brown grains, and the whole hid swings back when the case needs replenishing. It fits in a vest pocket, and hoofs a day a supply

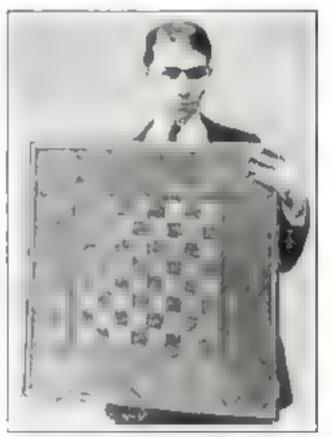
New Autogiro Model

R ADICAL changes have been made in strange behoopter-airplane hybrid, by its Spanish inventor, Juan de la Cierva, whose first successful machine of this type was described some months ago in POPULAR SCIENCE MONTHLY, In the original design, four huge horizontal windmill-like blades proofed on a rigid shaft above the plane helped to support it in flight. The new model enables this shaft with its blades to be tilted during flight to need varying air currents. The shape of the "windmil" blades is also changed. Four wheels replace the original two, with brakes on the front pair that bring the craft to a stop in a short space.



Silent Rifle Penetrates Steel

SHOWN above is the remarkable "silent rifle" recently reported from Germany, with its inventor, Hermann Pheth, a Berlin locksunth. The rifle uses, instead of powder, compressed air. Twenty-five ballets are contained in its inagazine, which can be fired a itomut-cally, without reloading. How he compresses the six to propel bullets at rifle speed from the muzzle. Plieth refuses to disclose. But in tests in the presence of Reschwehr officers, the bullets are said to have penetrated three millimeters (nearly one eighth of an inch) of steel at a distance of more than a unle"



Checkerboard of 14,000 Pieces!

For RTEEN thousand separate pieces of wood are contained in this amuzing checkerboard, made by Henry J. Beltarts, Jr., a young mechanic of Portland, Ore, Mahogany, maple, oak cedar, birch, black walnut, hierory, gimwood and ash were all used in working out the intricate design. The board is twenty six inches square, and the wood inlay is made up of three-sixteenth-inch blocks. It took Bellarts eighteen months to complete.

KNOW YOUR CAR

MODERN automobile transsembles have been so perfected
that trouble with these parts is
becoming quite rare on any
make of our until it has been in
use for thousands of miles of
driving. In fact, these parts of
the car will go on giving service even when they are builty
neglected. Neglect most often
takes the form of suck of proper
cleaning-out at regular intertals of 5 000 miles, and failure
to inhurate with a fresh supply
of transmission oil

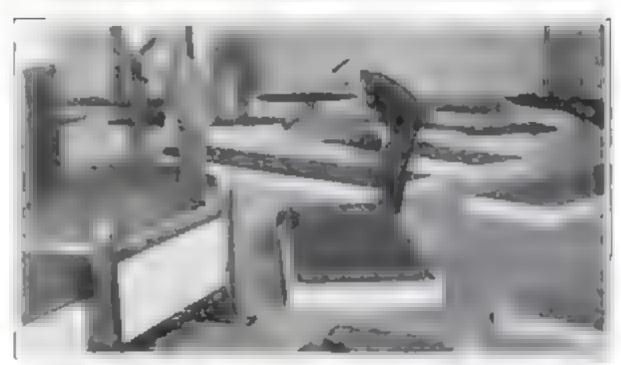
Ande from proper habricalian, the chief cause of excessive wear on the transmission of rear end of a car is barsh gene shifting and attempting to accelerate too rapidly. Just because your car is capable of getting away to a fly a g start in no excuse for making it perform that way all

the time

For long and satisfactory service from the transmission and rear axle assembly of your car, follow these rules:

- L. Clean out old fubricant at least once every five thousand miles.
- Always use the grade and make of lubricant recommended by the car manufacturer
- 3. Let the clutch in gently and pick up slowly

Miniature Golf Course for Business Men



Enjoying a round of golf on New York a new indoor course between business appointments

Invents Pump for Oil Wells

FTFR several years of experiment-A reg, Ace ple Chanosky, a voong oil operator of Texas, invented a nove, pump which, he save, will take oil sand and water from the deepest part of any oil well-

I was a sent paragraph or as as a Apply Apply comments and the nees of tubing, as shown to i - dustration nis - se s seret is a related so to tro, and a rece pade g



What An Angry Flephant Did

MOLF between appointments is now

J possible for New York husagess

men on a minutare in bor eighteen-hole

course located in the heart of the finanemi district. Each "green" requires a

1115 1 1 1 and the for the same of th No. of the last of etinicand mass vehicles w thick is susperful. pond cons rads were buried about fe

> straws. The keeper above, as to a the wreck they've boult elephant a new -------e that is twice as

different style of approach, and ingenious hazards call forth every club in the golfer a bag.

The player "tees up" his bull on one of the raised rectangles and tries to suck it in the corresponding hole. If the had rolls over the side to the floor, which is the "rough," it is replaced at the cost of one stroke. A few holes, such as the one in the center of the illustration, are straight and level, but most have curved upproschet and tricky inclines. At the left is a hole which must be approached by hoisting the hall over a fence

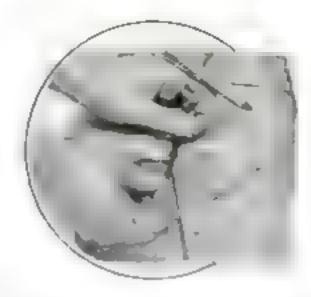
How Much Do You Know of the World You Live In?

F you are as observant as you should be you ought to be no eto. answer at least balf of the following questions, selected from logidresly sect in by readers. Turn to page 157 for the correct at swers.

- I. What is the greatest astronumical observatory in the world?
- 2 Where are diamonds found in the United States?
- Why is the magnetic compass useless in the Arctic regiona?
- 4. Where did the Axtecs get their stores of gold?
- 5. What land did Columbus first discover?
- 6. Where is platinum found In America?
- 7. What city has sidewalks bullt in two starles?
- 8. What is the hottest place in the world?
- 9. Which are the oldest mines In the world?
- 10. What are the monsoon winds?
- 11. Where is the most active mixture of races going on?
- 12. On what island is Hono-Julu?

Handy Blotter Fits on Pen

FASTENED to the cho of your four-Rustrated at the right is always at hand when you need it. The flat part of the chp carries three small poor paper, just big enough to use on a aigna ture or short memorandum. The rec-Imagidar shape of this part keeps the penfrom rolling about on the desk and protects it from breakage. An Illinois business man invented this ingenious device to aid him in the rapid signing and blotting of his busy correspondence.



You wan't lose your pencil when you need a most of it's turbed in this handy pencil holder that slope over your under finger. The ring is adjustable for any thickness of pencil, and feaves both hands free to the up bundles or for other tasks.

Here and There

with the

Inventors

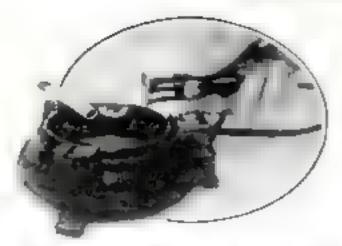
Hoisted nightly by a devrice over the Pareign boulevards, this despitingly distributed giobs stands out comparaously against the sky, the latest advertising idea of a round the world areamship company. Around the face of this nevel glube travels a ghip, and electrically lighted

Through the water off Los Angeles, Colif a few weeks ago, reced this smarting little motor boot, the Bulles II to have up as unofficial world's record for putboard motors of 21.11 miles as hour. Owners of high priced craft received a profound shock for the small speedy craft rost its designer and constructor, Dr. R. P. Pinker exactly twelve dollars to put together executive of the motor.



Hit the front pin true and aquarely and all the rest will topple—but it's harder than it looks, explains George Allen, of Georgis, to Bobby Jones, golf champion. 'left, standing'. Skill at puring is the object of this golf bowling game, which Allen invented Smeller than the can that oils it this microscope guardine engine, built by William A. Bruno, of New York City, charge like its bug brothers as it develops its maximum capacity of one eighth of a horsepower. Gasolina and oil tanks attached to the walt are in proportion, so is the tiny spark plug



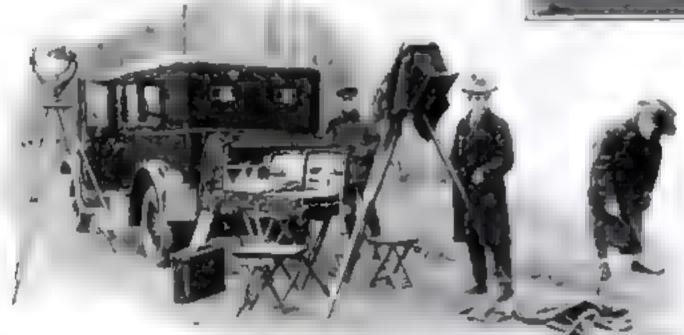


This steer has the gar given resing on the site of the sale to give in two a statum you have been by the sale of t

Amazing Speed Boat Built for \$12, Midget Gasoline Motor, Auto Crime Laboratory, Cigar Lighter and Other New Devices



Serving a double justpose has glube by mag faiture into the second of an Kasterius hast and enabled the characterist to give access your to request on the suitable to an an access to the suitable to the sui



Hot on the cased and not notice the life is which a standard detective a case of the notice of the life to be not a life to be not a life to be not a life to be a life to be



When you breather not what happens on its beyons brings? Somewhat have deviced this arranging array of equipment above recently in Washington D C to discover the chemistry of breathing. The agrees us at the left measures for analyze the sid had the subject inhales while at the right another row of bottom typics in the various products of his respiration.



Out of a single block of worst number has imaginate set of av factor the set of the pega or bold. The set of a new congress that is the factor the set of the set of a new congress that is the set of a new of save H E Se series to Law Augules performs but the good factor the the photo below

He Whittles Chains from Toothpicks

Some of D. D. Rankin's whittlings and, at right, the sunster whittler himself, making the twenty pairs of piters, which fold back again into one stick of wood

Ship Models of Bone

"TO THE ever-increasing list of specialized professiona must be ndded that of T. Begafort of London, England, whose unusual occupation is the restoring of home n oaels of historic sating vessels. Some of the models, the details of which are carefully made to scale, were the work of French prisoners at the time of the Napoleonic wars. Bones from their own tables and the cooks, kitchens were the only materials they had to use, yet with these they shaped and polished gracefully curved planks for the slaps' sides, worked out every detail, and finished their work off with delicate curving. At present the manuface

Mr. Heaufort is shown below checking up the measurements of one of the damaged ships he is repairing.

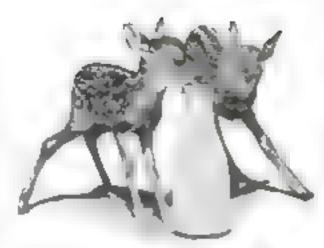


Restoring ship models of bone his unusual necupation: T. Beaufort, above, shown thecking the dimensions of an old warship model, which is complete in every detail

TWENTY miniature pairs of phers which unfold from a strip of wood a quarter of an inch wide and sixteen inches long, is only one of the whitling feats charged by David D. Rankin, of Detroit, Mich. To past the time on a rainy day, he will carve a five-link chain from a toothpick, and one with ten links, or, perhaps, three pairs of phers, from a single ordinary matchesisck.

Some of the intricate pieces which Rankin has carved from wood are shown at the left, including ornamental designs and emblems, in bas-relief and openwork, chains, the longest of which measures twenty-three feet, and tools.





Half-Pinters-Quart Appetites!

SCARCELY larger than the bottle of mulk they are feeding on, these half-part deer, newest arrivals at the San Diego, Calif., soo, are seen taking their eleventh breakfast in one morning. When only five minutes old they were jumping about with the lusty vigor of young bucks. They weigh only nineteen pounds each just now, but give them time!

World's Largest Searchlight

A SINGLE beam of light from the world's largest searchlight near Paris will soon guide night-traveling airplanes southward from the coast of France at the point where they arrive from England until the serial lighthouse at Dijon picks them up and directs them with another beam on to Marseilles.

This light, powerful enough to pene-



portator, where they construct models of famous eterminist

They Made a Hobby Pay

TWO brothers of Pasadena. Calif., Wallace and Roscoe Good, are shown above at work on a model of the S. S. Malolo, one of the largest ateamships ever built in this country, which is to be placed on the San Francisco-Honolula run this spring. The building of steamship models, first taken up as a pastine, has developed into a profitable business for the brothers.

The model above, scaled down to one eighth inch to a foot, is seventy-tured inches long. Every detail of the construction is reproduced in exact proportion, the model being constructed from the blueprints used by the builders of the Mololo. The hull and superstructure are pine, the daylis and anchors white metal, and the propellers and fittings brass.

trate heavy cortains, is located at the top of Mt. Valerien, the highest point in the immediate vicinity of Paris. He twin reflectors measure each about six feet in diameter and its arcs are lighted by a hundred-borsepower plant.

While the expense of running such an outfit is naturally great and the light will be used only when needed, it is expected to handle the regular commercial airplane service from London to Marseilles.

New Loud Phonograph Invented

A REMARKABLE new phonograph said to have the tone volume of twenty orchestral instruments is a new invention reported from Germany. Tone volume is said to be augmented by the influx into the soundbox of a mixture of atomized air and oil generated by a hand pump and projected to the resonator

Last Word in Aerial Railway Luxury



Now-the Airplane Trunk!

YOU can carry an entire wardrobe in the ingraious new piece of luggage, which, the igh the size of an oro harventease, has the capacity and crotics protection of a wardrobe trunk. Designed for the limited accommodations of airplane travel, it is equally convenient as a space-saver on a train, where it sludes out of the way under a Pullman seat. It would also prove useful on an automobile or steamer trip.

Within its modest dimensions, according to the maker, is space for four suits, two extra pairs of trousers, and other articles of a man's attire; or, in the model for women, twelve dresses can be tacked away, with pienty of room to spare for incidentals. When the case is opened, hangers that keep the clothes from wrinking may be drawn forth for ready access. The model illustrated is only nine inches deep.

SISPENDED high above the Bavarian Alps, the workman below seems as comfortable and unperturbed as the occupant of the fusurious cabin at the right, which is the standard rolling equipment on the new Alpine serial ranway up the Zugspitze, recently completed. The occupant of the cabin is no less a personage than the president of Austria, Dr. Michael Hamisch, who took the first ride over the cables. The workman is inspecting the cable to make sure everything is secure for the inaugural trip.

The new railway is nearly 10,000

The new railway is nearly 10,000 feet high, and runs to the sumout of the highest mountain in the Bavarian Alps, the Zugspitze.



Above, type of car used to carry sightseers to the top of the Eugeptim in the Baverian Alpa, Left Workman making a tour of unspection of the newly drawted cable before the initial trip

His Galleon Wins Prize

"HIS model of a Spanish galleon. illustrated below, made by a convalescent patient in a New York City hospital after the design first published in the May, 1926, muse of Popular Science MONTHLY, recently brought a substantial sum at a benefit asie for shut-ins held at the Women's City Club of New York. The illustration shows Bird S. Coler, public welfare commissioner of New York City, buying the model from Mrs. H. Edward Dreier, president of the club. The constructor of the model has as lfully and faithfully carried out the assignation from the state of Spanish fighting slop, which was also used for the transportation of gold.

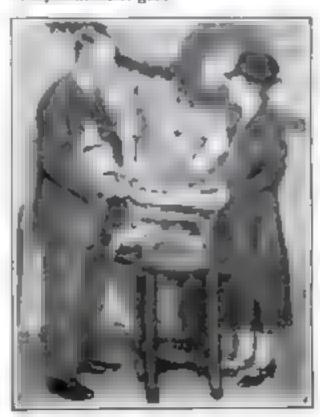


A Speed Boat Disaster Made to Order

SNAPPED just as the runing speed boot blew up with a terribe detonation and a shower of splintered wood and flaming gasoline, the remarkable photograph above shows what hornfied spectators witnessed the other day at a race at Newport Bay, near Los Angeles, Cald. No one was injured, however, in the spectacular explosion, which was staged for a movie thriller. The pilot of the demolished craft leaped to safety a moment before the explosion, and was

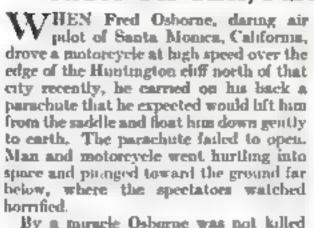
picked up by another boat. Clever photographic work will eliminate the leap overboard from the completed photoplay, making it appear as if the "villain" perished in the blast.

Setairs or Tuneractive is made from the sap of trees—in America from the long leaf pine—the sap being drawn from the tree much as maple sap is. Distillation causes a thin fluid, which is turpentine, to separate from the mass.



This margaificent model of a Speciels gallene, was built by a patient in a New York hospital

Rides Off Cliff, Parachute Fails to Open!



By a muscle Osborne was not killed outright, his dizzy fall being broken by telephone wires. He was carried from the beach in a critical condition. The motorcycle, a twisted mass of weekage, burst into flames. Notice the half-opened parachute at the left of the photo below



Ochorne at the moment he expected his parachute to open, Left after the track

Freak Tree Loops the Loop

WHEN it was only a few feet high, this tree apparently decided that it thin that it it the tree apparently decided that it think that the world's looks, so it turned back in the direction it came from. Then, after a whole, it started life over again, and the result was the currous freak of nature in the illustration. Notwithstanding its unusual shape, it is a healthy and thriving speemen.

Frees, of course, have been known to overcome amazing obstructions in seeking a path for growth, even dislocating floorings and walls in buildings underneath which they had taken root, but the forest transper who came upon this one could discern no apparent obstacle to its nor-

mal development.



Meet the Acrobatic Musicians!

PLAYING twenty-odd instruments at the same tone is a simple matter if you use your mouth, elbows, fingers, knees and feet simultaneously, say these two brothers, Circero and Ahmer Weaver, founders and sole members of the Arkansas Jaaz Band. Circero, at the left, is demonstrating a quaint instrument of his own design. Combined with it are a few bests, an automobile hore, a cymbal and a pistol (attached to the end).

A tambourne, time cymbals and another noise-maker of original design and fearful results are strapped to Cicero's legs. Abner a curious banyo-mandous supports a horn, too, at the right height for his mouth. The odd looking rake is really a "flute." and the musical saws and rather complete the outfit.

The brothers have been touring the country with their unique instruments,

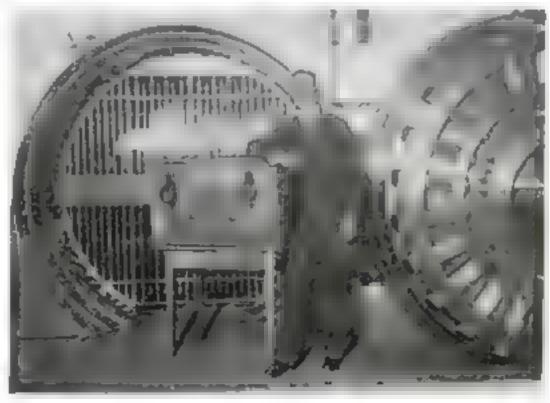
Old and New in Strong Boxes

A CENTURY ago, people kept their valuables in strong boxes like the one in the picture below, with iron padlocks and creaking huges. Just behind it is the last word in theft-proof deposit "boxes," the new vault of the Bank of America in New York City. Note the complicated locking mechanism, with its team of gears that operate formulable bolts all around the rim of the circular door, and the massive langes, smoothly supporting the tons of bardened steel that hang from them.

The old strong box in the picture is said to have been captured by the British troops during the War of 1812 A RED diamond weighing eighteen carate has been reported found in the Lichtenburg diamond district, South Africa. Red diamonds are very rare and command high prices.

Pale Hands Warm, Red Cold?

WHITE bands, contrary to general belief, may be warm, and red hands cold, according to a report to the recent congress of the Society of German Natural Philosophers and Physicians at Dussidorf. The warmth of the lands depends socily upon the amount of blood supplied to them, it was paided out. The color however, is determined by the position of the capillaries.



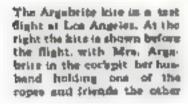
Edward C. Delafield, president of the Bunk of America, New York City, contrasting the "strong boa" of a century ago with the anglity genred doors of a modern safe deposit vault

Remarkable Kite Built to Carry a Passenger



SIX men have all they can do to hold this giant man-carrying late by long ropes while it some aloft. It has carried its inventor, George A. Argabrite, of Los Angeles, Calif., far above the earth more than two hundred times without mishap. As seen on the ground, in the picture below, its lines suggest an airplane. In flight, the lower half is visible as a wing and tail combined, completely obscuring the figure of the passenger.

Two separate ropes are used to steady the man-carrier in flight, one attached to the bottom framework at the front and the other near the tail, Complete landing gear, isolating four small rubber-tired wheels, maires a smooth descent. A dummy was the passenger in the first trial flight, which demonstrated that the machine would carry Argabints s 186 pounds aloft in complete safety. The kite can also be unchosed in the air, and used for observation purposes.





Ther spalers, the highest-up animals on earth, have been found living 4,000 feet above any vegetation on the slopes of the Himalaya mountains in Asia. Since they are entirely surrounded by snow ice and rock, the maintegreatures must ent each other for food.

Who Says Bike's Out-of-Date?

YOUNG America demonstrates, below, that, for from being obliasionned, the biggele is still a highly popular method of locomotion. This small acres of two-wheeled vehicles is not the start of an international lukerace its just an everyday scene after school at a justor logh school in Les Angeles, Calif., where 300 pupils "bike daily to and from their bosses and school. Parking apace has been provided by the school authors is.

First Eel Egg Found by Woman

THE origin of the common cet, a mystery since ancient times, is solved definitely at last. The discovery of the first eggs of the American ectover obtained was reported recently by a twenty-five year-old woman scientist. Mrs. Marie Poland Fish, biologist of the U. S. Bureau of Fisheries.

The eggs came from the depths of the sea south of Bermuda. Mrs. Fish found them while she was at work sorting marine specimens which had been brought to the surface in a trawling net. Later one of the eggs hatched and the larva was identified.

The mystery of why men for centures have searched in vain for cels' eggs was solved by the discovery that the American and European cels, unlike any other known creatures, live in fresh water but go to the ocean to spawn.



Mo special has service is needed to take those Los Angeles boys to und from school?

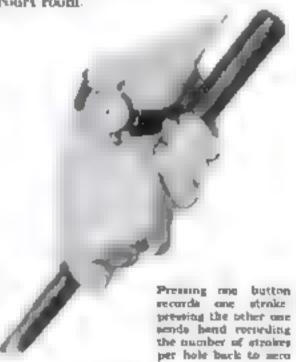


Tropic Fish Has Nest Like Bird

An ODDITY of nature, this strange fish, of the genus Epinephelus, found in the tropic seas of India, weaves a next of scawced in an underwater tree. Lake a bird, it lays and hatches its eggs within the next. It is easily frightened and changes color when a timp enemy approaches too close,

Microphone for Witnesses

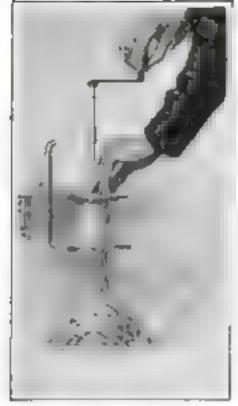
JURORS don't have to strain their ears to eatch every word of a witness's testimony, in a Baltimore, Md., court room, where witness's words, spoken in a low voice into a interophone, are amplified by a londspeaker for the judge and jury. Supreme Court Judge Joseph N. Ulman has installed the system in Juscourt room.



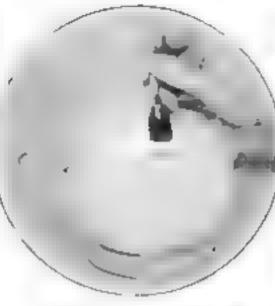
Golf Watch Ticks Off Strokes

WITH this new counter, there can be no argument as to whether the golfer took and or seven strokes to make a hole. After each shot, he presses a button to register it on the counter, when he has "holed out," another button returns the pointer to zero ready to record the strokes of the next hole. Resembling a watch, and strapped to the wrist, the golf meter records thus score on its "minute hand," and an "hour hand" totals the strokes for the game.

Sixteen Ways to



Not only does this angentous machine slice fruits or vege tables to any the intent, it also 'absentings' them or cuts them to any shape desired for use its talada and fancy dishes.



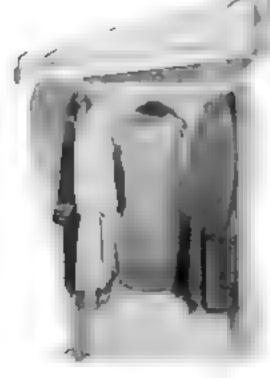
In there water to the milk? The housewife can tell to a offy, with the test og instrument shows above. It reveals whether milk is altermed unakimmed or watered, or cording to the last number visible on its scale as it figure in the liquid



A one-legged table can have many takes when built to fit armchars as neatly so the one shove. Adjumpths to any bright it ten flat for solutaire or arwing, and slants for uniting, drawing or reading. The leg folds up against the top



Knives can be sharpened in a pity with this handy grader. Place the knife between the wheel of also live material and one of the advantag tretal course, draw the knife back and forth, and the job is done



Steam-posched eggs are easily made in this new poscher, with his tray of individual

removable cups, to lawer

pan for bothing water, and its deep cover for steaming

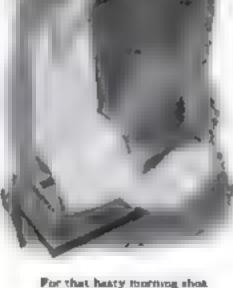
> Used for making beef tru and other ment extracts, this little cooker is placed in water in an ordinary saucepus. With ment or regetables and a small quantity of water within, the device is orded and heated in boding water until the full flavor of the point has been extracted

Closet space, always at a premium, is made the most of by a new type of clothes book, illustrated at the left. Sa hangers may be hang at once from its notched edge. The notches prevent hangers from slipping off or crowding together. Only three such hooks are said to be sufficient, to equip in archancy small close.

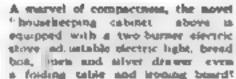


Preling potatoes or apples foses its drudgery when all you do it turn a crank, as with this ingenious peeler. A sharp knife removes the peel is one piece as the shaft holding the apple moves lengthwise on a screw Lighten Home Tasks



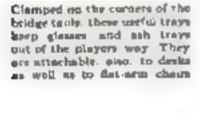


For that heaty tearning shot shine, here a an outfit that will new the furniture and your back. Around the foot test rups a wire her. Peaced over the shoe and under the bar on either side the polinhing rioth can be handled teasily from an erect profition.





Two sets of bristles are the feature of this novel combicleaner. When you equests the handle, tufus of bristles, run through the comb from such side, inaving it cleans





One tump or two? It's dauntily done with the opting tough built into the tid of this moved sugar howl, so that you off tough and tid at case. The sugar, tun is better protected from dust

A detachable mon wringer ad untable to any sure pail, is a new aid in floor mopping. To use it, rollers are present together with the foot and the money pulled through easily with the hand



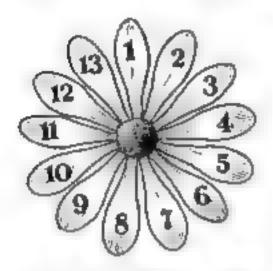


A "sipper" fastener is a feature of a new watdrubt beg, chosing the bag tightsy against dust and insects. A wire frame holds the bag rigid

Sam Loyd Offers

Six New Tests of Your Wits

Brain-Teasers to Show Whether Words, Facts or Figures Are Your Forte



Are You a Good Strategist?

HERE'S a new version of the damy game of prognosticating your matrimonial future by plucking the petals of a flower. The game is played by two persons, who take turns plucking the petals. At each play the player is privileged to remove any one petal from the circle, or two petals, provided they be contiguous, none having been removed from between them. Thus the game proceeds until finally one player removes the last petal and leaves the "old maid" strong for his or her opponent.

Of course, the strategy of each game is affected by the chance numbers of petals to be dealt with, but for the purposes of our mental test we will assume that the full-fledged dairy has thirteen petals.

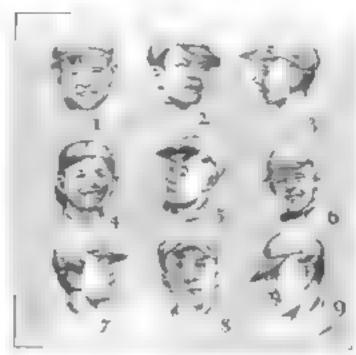
If you were starting a game with the classy of thirteen petals and your opponent, having first play removed petal number 1, what would be your best play in reply? Weach has the accountage, the first or second player? The answer and your rating are printed on page 141,



Are You Quick at Figures?

JOHNNY performed his example in multiplication; then he made a little paragraph of it, as shown above, by erasing thereen of the figures and challenging the family to discover his multiplier. Sister Kitty "cooked" Johnny's problem by discovering that he might have used either of two multipliers to work out consistently with the evidence on his slate. Can you daplicate Kitty's feat?

If you are quick at figures you'll follow up the clust easily. Turn to page 141 for your rating.



Do You Spot Clues Quickly?

Solve for a moment the determined physiognomes of the Young Gunts, galant team that carried off the First Wart permant under the inspiring leader-ship of Shahry McC and In the picture, they are arranged according to their ages. They are exactly aix months apart—increasing by balf-yearly jumps from the first to the math. The total ages of the first five players equals seven eighths of the combined ages of the last five.

Soubley is the smartest sixteen-year-old diamond strategist in town, so see if you can identify him from the information at hand. To see how you rank as a deductionist, turn to page 141.

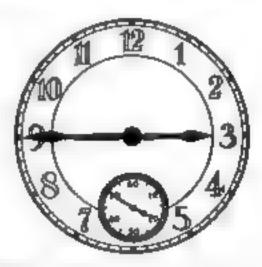
Can You Find the Right Words?

SAID the ant to the cricket when the latter made his usual prewinter hid for a loan. Do not think to find me a from his fellow. I would be provided the fellow. I would be the class, with a charming voice and a mood, albeit you are somewhat of a mid —— in your speech.

"Why you let the springs of industry lie — in the season, when there is work for all of us. I understand. You must that inisery and are invariably - upon unprovidence. Nevertheless, I shall not be entirely - to your appeal. On the way out of my garden you may stop at the —— and stake your thirst."

Can you complete the ant's homity by placing in the blank spaces appropriate words ending with "ant"?

If you are possessed of a generous vocabulary and a faculty for quickly producing the words which most aptly express your thoughts, you should solve this without much mental agitation. Turn to page 141 for your rating.



What Was the Correct Time?

IN A recent holdup a bullet struck the face of a clock, lutting the exact center of the dial, driving the post of hour and minute hands through the works and instantly stopping the clock. The hands were fixed in a

straight line, though not as shown above, for it is evident that a correct time is not indicated. It is assumed that the hands apan about after being welded together by the bullet.

It proved quite a problem for the authorities to prove what the exact time must have been, not neglecting the elew provided by the second hand, and assuming that the three hands were running in perfect coordination. Can you do it, too? Time yourself, then find your rating on page 141.

A Test of Organizing Ability

THE figure below, taken as a whole, is composed of three similar squares, hack of the four sections into which it is divided as likewise composed of three

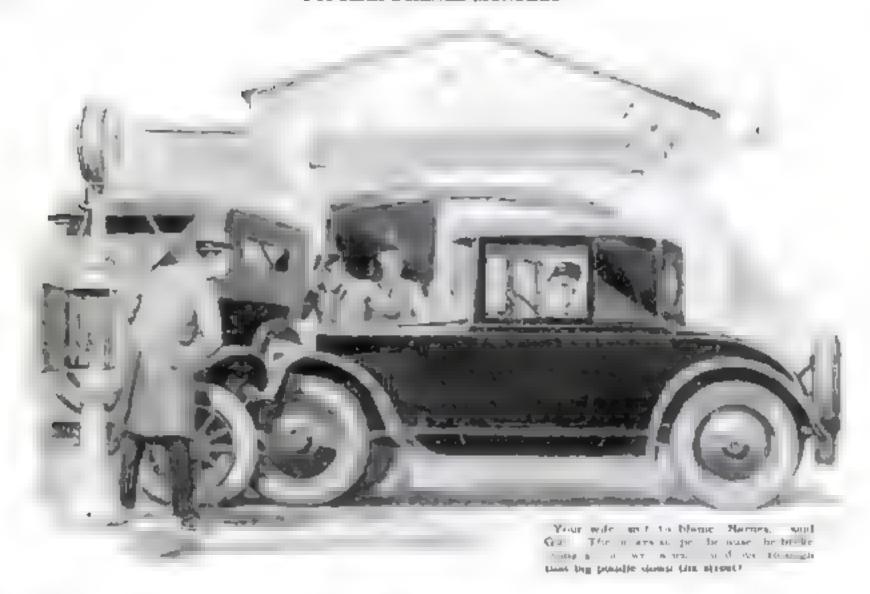


win lar squares it illustrates how a planter be quent leed his land to four sons, treating attexactive alke. Now, the total runber of square toles in the hig treet was the same

as the number of linear must of fencing that makes d and divided it into the sections. The problem is How many square miles of land did the puniter leave his boys?

Here is a test of your ability to grasp visually and organize the factors of a concrete proposition. Time yourself, then turn to page 141 for your rating

Sam Loyd, author of these entertaining and instructive tests, is the world's greatest puzzle maker. Are you following this fascinating page of brain-tessers from month to month?



When Your Wife Learns to Drive

Gus Gives Some Pointers for the Woman Motorist

By MARTIN BUNN

OW I suppose we'll knye a little peace and quiet around here, 'Gus Wilson grumbled to his partner, Joe Clark, as the latter finally stopped Lammer up on the fender of his flivyer. A truck had side-wiped Joe's car on the way to the Model Garago that morning

"Aw, quit beeling" snapped Joe. "It's got to be fixed sometime, hasn't it's

But Gus was doomed to disappointment, for the next moment the two garage men were startled by the sound of a crash, followed by the tracing noise of broken glass. Dropping their took, they rushed for the door. Directly in front of

the garage a car had rammed into the rear of another ear parked at the side of the road. The force of the call sion had been sufficient to smash both head ights and wreck the spare the rack on the parked cay.

"Now you've done it! Didn't I tell you to put on the brake?" the owner of the car was shouldng, hopping about excitedly.

His wife was still atting helind the wheel. "But I did put on the brake as hard as I could. Dick," she protested "It just duln't hold!"

Gus, who had been examineing the brakes, now walked around to the front. "Your watersn't to blame, Barnes," be neserted positively. "The brakes did slip because the brake lining got ad wet when you drove through that log mud puddle down the atreet, and when the brake lining is wet it doesn't hold near so well as when it's dry."

"Sure, I know it doesn't," admitted Barnes, 'but that only means you've got

What Was Wrong with Spratt's Car?

IN THE December issue we published a story detailing the troubles of Henry Spratt with a secondhand automobile in which he and his wife had started out on a long tout. We offered a price of \$25 for the best letter explaining the trouble with Spratt's car and telling him how to overcome his difficulties.

Guy F. House, of Lost "prings, Kansas, wins the price. The vacuum tank float in Henry's cur was leaking, and many contestants demonstrated their knowledge of auto mechanics by indicating this as the source of trouble. Only two out of the entire number however, instructed Benry to tern his earlierter back to its original setting and showed bots how to get to the nearest garage. Of these two, Mr. House in the opinion of the judges, offered the most accurate largeous of the trouble and the simplest and thest effective way to proceed.

to press a bit harder on the pedal. It's no use—he growed, shrugging his shoulders. "She'll never near how to drive a car in a thousand years! It makes no difference what I test her, she does exactly the opposite."

"Is that so!" mapped but wife, who by thus time had recovered somewhat from the shock of the accident. "If I can't drive, whose fault is it? You just keep nugging at me until I get so fussed I don't know what I in doing."

Seems to me it not tall your fault at any raise. Mrs. Barnes," suggested tous mildly in an attempt to stop the family seems that threatened to develop. "In

the first place. I notice that you haven't any casalon at your back and as you are not so tall as your husband, you can't reach the pedals properly or push them hard enough.

THEN it's always but dope for a man to try to teach his own wife how to drive. No wife likes to play the damb-bell before her historia, so she won't admit she doesn't understand everything he tells her the first time. She makes mistakes. He becomes impatient and sareastic and the war is on. Bendes, just because a man happens to be a good driver himself is no guar- (Continued on page 147).

Practical New Aids to Motorists



Here is a much hook that will pull you out of a hole with size it consists of a heavy, sphed cross member with hinged side arms instroled by a hole so that the heat can be damped around the tire to the edges of the size

One pull on the plunger of this aperial quantities tank eyphon starts a stoody stream flowing

into the tank of the camper's

gasoline stove, or into a can

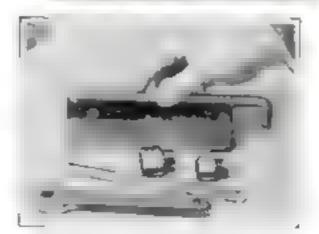
to help out a stranded motorist

Syphon Oil Bottle, Gripper Mud Hook, Socket Wrench Set and Other Handy Time-Savers



Strug ng na to tagerror e anen menno en ngombre the e a ham ya de ma a ya demonte go. The mear and resolve to the anexament of state has the decay of the Anexament of a resolve and have go the effect of an anexament.

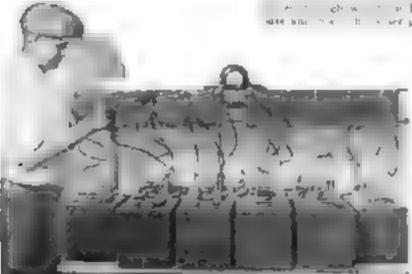
count in he doe of water



The metal tray into which the society and handle of this weeks kit fit has end to be with a betagonal pieces sate and the life of parts in the tray The time of the present control or the off of the time of the control of the cont



Most automobile starting betteries are allowed to run low on water through forgetfulness on the part of the owner. This moved indersor automatically tells whom the level is getting too low. When wired as shown in the diagram, the red light on the dash will flish on each time the brake is put on if there is at II sufficient water to the bettery. When the level falls too low, it no longer issues contact with the lead plug is the filter cap.



This new bettery charging panel simplifies the work of the bettery service station. Instead of using chips or knife switches, a row of jacks to provided with plugs on the cables. The upper row of tacks is connected directly to the rocatest voltage charging generator. The second row gives summeter readings



"No one could make Stradivarius violins by mass production"

Thomas A. Edison now answers a questionnaire

 \mathbf{F}

ROM his laboratories Thomas A. Edison has from time to time issued questionnaires. Now, he has consented to be-

come the interrogated—has agreed to lay bare his half-century of effort to give the world perfect Re-Creation of music.

In plain, untechnical words, Mr. Edison here tells how he has made a marvelous musical instrument with all the painstaking care and individual detail of a Stradivarius Violin.

The questions asked Mr. Edison were:

Quest. Do you take advantage of the economics of mass production

in the making of your phonograph?

As I consider the New Edison Phonograph a material instrument and not a mach no to be made in the manner of antomobiles, these from the in form I am a so not a prime ensemble.

Quest. Isn't it possible to make instruments of standard quality by mass production?

Aus. No greater proof of the fallacy of this, as far as phonographs and other musical me-

struments are concerned, can be offered than the vain efforts of violin manufacturers to make violins of Stradtvarius quality by mass production. For although every part of the instrument may be exactly alike as to say, unless their is the individual human touch, there is bound to be a variation in tone quality.

Quet. How can the layman tell the difference between a phonograph made by mass production and one made by craftsmen?

Ans. Anyone is apt to be satisfied with existing conditions until he bear a something better may even excuse distorted tone for want of a superior instrument. Hat when an ordinary phonograph turned out in quantity is compared side by side with one in which human hand work has played. If part, the glasting difference instantly is apparent.

Ques. What do you consider the

There is no measure of tene

an ear log the reparation between the manual and ter phonographs, has end, I have a release to the replace on the security boyer the New led some in any home where comparison with other types of phonographs is desired.

Ours. How would you describe

the a Cealing

to north north

EDISON PHONOGRAPH

the tone of the New Edison Phonograph?

for It is sheer nonsense to speak of the some of a phonograph or of its resonance. A phonograph should have no tone of its own. The instrument should be only a medium of Re-Creation. Obviously you should be unconscious of it and hear only the beautiful mane it Re-Creates.

I worked for five years and spent more than \$1,000,000 in experimental work to remove any false tone from the New Edison. Even when I, myself, was satisfied with the results I did not stop there. I instated that the New Edison be submitted public to the test of side by side openation with hving artists whose performances had been recorded. Exacting maste entire goald defect no difference between hving and Re-Creation performance.

Why There NEVER Can Be a Better Phonograph

After all, the phonograph serves but out purpose—to Rest regre voice or instrument with human reality. When a phonograph does this, nothing more can be usked—it has seached perfection

That the New Edison Phonograph achieves this is fact—not theory nor hopeful expectation. During more than 6,000 tests in Carnegia Hal., New York, Symphony Hall Boston, and in other noted music centers, a build seeks were made with Young artists who sang or played before a critical public in direct comparison with the New Edison Phonograph

For near mancal critics who attended these tests I am it imposs hie to desect the Eving voices of instrumental performances, from the New Economics of the New Economics of the New Edward on ResC calend that the New Edward on a way that hafflet the keenest ear in the effort to describe the time performance from the Edward

Hear the New Edward Phonograph 1 is on at an nearest Edward ale a also get him to play one of he Edward are not a coords, the install a parcet ach exement a record no larger than the ayour short playing record

on alt

which is much you to enmy withour intestign in a complete concert on one double-faced record.

The New Enrion has always soid by comparson compare it vocasof with any other phonograph and se year own eats pecide

OK Shall size

WATCH FOR OTHER QUESTIONNAIRES BY MR. EDISON



What every garden needs

Is your garden merely a growing place for grass, trees, flowers, or vegetables? Does it offer you an inviting place to rest?

The whole family will use and appreciate a comfortable garden seat. It is so easy to make a garden seat that no garden should be without one or more. Stanley Plan No. 21-E gives complete details for making such a seat.

Confidence in your tools will make any job more enjoyable. The amateur user needs good tools even more than the professional. Stanley Tools can always be depended on, as nearly every American carpenter knows. Thousands of manual training instructors use Stanley Tools in their classes. The Stanley name on a tool is your assurance of durability, correct design, and right "feel."

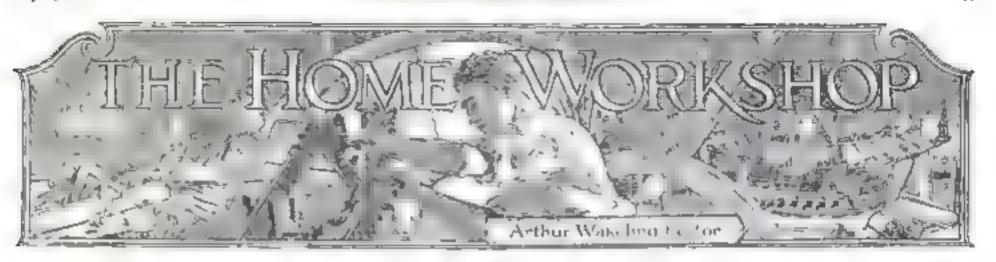
You can buy Stanley Tools separately and so collect your own set. For your convenience in buying there are also complete sets of Stanley Tools in chests at a wide variety of prices from \$15 to \$95. Or there are assortments in strong cardboard boxes containing directions for making your own tool chest. Price \$5.00 to \$20.

Your hardware dealer has Plan No. 21-E as well as other Stanley Plans for making useful articles, or he can get them for you. The plans cost only 10c each. Ask him also for Catalog No. 24-E which shows the most complete line of woodworking tools on the market. It is free. If he cannot supply you write to The Stanley Works, New Britam, Comp.

The best tools are the cheapest to use Ask your hardware dealer



STANLEY TOOLS



New Uses for Plastic Paints

Building an Ornamental Fireplace without Masonry -A Treasure Chest - Walls and Ceilings Other Novelties

AS VIESULT of Eleanor's most ence, we had redecorated the walls and cell agrof three of the rooms to our noise with roughtexture and color effects.

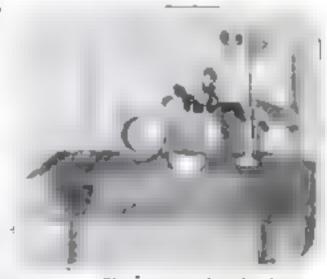
By E. M. OREN

brush marks showing and then smoothing them down with the point and the heel of the band. The mountain texture was made with a four such wall brush only, and the Colorial texture was obtained with a pointer sordinary stopping brush

I had parened to tell you first in the article how we decorated the other three rooms and the listings of our house with plastic paint. But between writing the first article and thus, Eleanor decided that what we needed in our living room was a fireplace. So we made one—with plastic paint. There is a picture of it on

The first thing I made was the frame, for which I had enough scrap bender in the basement. And I can expand in a diagram spage 79) how this was made much easier than I can in writing. After the frame was finished, it was quited to the wall and covered with gypsim (plaster) wallboard.

Next the joints of the wallboard were resultinged with steeps of strong fabric, purchased with the wallboard. To cement, the joints plantic point was used. First, the joint was "buttered" with a thick



Glass politery and monders objects with plants point ornamentation. The candidate on and bowl are blue the atencied bonism dish is silver, the year a broass

Touching up the beyboics of the terasure cheet with black. The lock pintes, hinges and straps are of plastic pant.

How we accomplished it, I told you in an article in the January usue. Briefly, we decernted the walk of our by 1 grouns in Spanish text are the walk of our during room in Italian at let the redings of both in a monastic firms, and the a tenen in a Colonial stopple.

Now, to do all this we used "plastic paint," a material in white powder form, that is bought at the paint store. It is mixed with water, first. Then color is added either mineral pigment or good oil color, until the desired shade is reached. A large brush, such as a Dutch calciumne brush, is used to apply the plastic paint at it is "tacky," the rough texture is developed. The back of a kitchen spoon was used to develop the Spanish texture. The Italian

texture was developed by leaving the

Infreplace
of wood, was
board and
plastic purit.
The ama i
chest on the
than'el and
decorative
panel above
were aten
eiled with
plastic paint

this page. One would hardly attempt to build a fire in it, because it has no chemney. But it does add materially to the americance of our hying ruom, and it was more than simple to make.

muchine of plastic paint. Then the fabric was pressed lightly along the joint. Next a sensitionable putty kinde was drawn down the joint with subscient pressure to force the plastic paint up through the mesh in the fabric. Nail heads then were "spotted" with plastic paint. After the whole had dried, the joints and nailheads were lightly sandpapered.

The freplace then was ready for decuration. The plastic paint was mixed in the usual way ap-

phed over all surfaces and stipped with a stipping brush. A deaftsman's trangle was dragged lightly down the surface to father some of the stipples. Keystone, cornerstones and footened on page (8)



Supplies of all our historic ship models in bris land charry ing description may be finished in brilliant colors.

Blueprints with full size details of all parts are available for thin romantic model, which populate tachnical akul to construct

Here Is a Ship Model All Can Build

This Colorful Viking Vessel Is Easy to Make and Is Inexpensive—The Materials Cost Two Dollars or Less

Gothmund spake:

Secoft levels be hard by the land (Mastering harts and neights words). Wealth of shortes and well planed over). The kings fair host the Villings haughly; Fifteen hands to land have faired. But out in Sogn are seen thousand.

At anchor being off Grapeland
Are for bearts black all filted with gold;
There and most of the forman's men,
Nor will Helgs long the battle delay.

—EDDIC POEM

HE time is some eleven handred years ago and the scene the rune-carved ancestral bull of Varios on the shores of Varios-familia Norway

Various growing old. He is nich to everything but sand. His half is replete with gold, fine fabrics and great treasure of other lands, but his odal is small.

Therefore on this day he gives one of his skutas or dragon ships to his son Lief, telling him to go forth and carve fame and fortune for himself

Lief, eager for the word like a mettled stallion, gathers around him neventy of the young men clamorous to follow him in

By CAPT. E. A. McCANN

Viking voyages of adventure discovery and acquisitions to visit friendly parks, hostile countries or unknown lands—to return with gold and wives.

Lief's ship was a war vessel, distinguishable from a merchant craft by her longer lines and ornamentation. She was called variously a skuta, a long ship, a dragon ship, or a long serpent. Her extreme length was 79 ft., the breadth 1834 ft, and the displacement or weight with fittings about 20 tons.

She was shin, but very stordy and senworthy. Her object was, will cars and sail, to strike swiftly and hard and to withstand the knocks of an enemy or the battering of the fierce northern gales. His step was not only useful it was exceedingly decorative, with its carvings and its black and gold color scheme

I infortunately, we cannot ourselves go visiting and raiding with Lief, but from authentic data available we can build a model of such a vessel as he used. Those who care to follow carefully the instructions given here can make a dragon slup model without much difficulty and with

little or no expense. Even if all the materials and paints are purchased, their cost should be well within two dollars.

The main dimensions and details of the long-slop or was vessel here described are based on the actual Yiking ship which was discovered in 1880 lying in a tumulus, or grave mound, at Gokstad, Norway. This ship is preserved at the University Museum, Christiana. Some details of our model are from a merchant slop found at Oscherg and others from the Nydam slop, as well as from the Bayeux tapestry and the Eddie Sagas.

IT IS proposed, however, to simplify the construction, so that, while retaining the correct dimensions and appearance, any reasonably handy person can make the model from easily obtainable materials with such toos as are to be had almost anywhere.

To make the building of the model still easier, two blueprints have been prepared with full size drawings of all the parts and a complete list of materials. These you can obtain by sending 50 cents to the Blueprint Service Department of Popular Science Monthly for Blue-

prints Nos. 61 and 62 (see page 93).

Now to work! Instead of laying a keel and on it erecting stem, sternpost and ribs and to these building up the sides, plank by plank, which is tedoors and difficult work, we take a piece of M in three-ply wood 20 M in long by 6 in, wide and from it cut our keel, stem and stem in one piece. This we shall call the center piece. It is shown on page 88 and is insticated by the heavy outline on blue-pent No. 61

Those who have not a fretsaw will be well advised to buy one, as it will be handy all through the work. It should have at least a 12-m, how and may be nurchased at any hardware store, with blades, for about a dollar. However, this and the other pieces can be cut with a nucli cheaper and smaller coping saw.

BEFORE we go any further, it will be noted that the centerpiece extends well into the body of the vessel at the bow and stern; these two portions lie under the fore and after decks, which are built up solid. Those who prefer and have the skill may cut away these corners of the centerpiece to an even curve and later bank up the bow and stern lockers and declost indeed, this method is rather better, but is more trouble. H you do this, the corresponding corners will also have to be ent away from the side blocks, which are to be described next, leaving the heat bollow from end to end. Reton sufficient wood at the ends for gh ing and nating.

Next to be made are the two side blocks, which form the body of the lintl. Each piece is designed to be made from a piece of \$\inf_{\text{-}}\displays in. pine or other soft wood glased to a piece 144 to. think. These thicknesses are easily obtainable from any lumber

easier to see just where one is laying the plan. Then, after the tracing has been panned down to the wood in several places, the carbon paper is slipped between it and the wood.

The waste wood now should be cut away to these lines until the block will be accurately on the blueprint or plan. The blueprint shows the starboard (right-hand) side; the other will, of course, be in reverse. There is a slight difference between the bow and stern ends. Here again the tracing is handy because it has only to be turned over for marking reverse sides.

On the top edge of the blocks mark the outline that is emayalent to a deck plan. With saw, clisel and spoke-shave, cut away the waste to



Captern McCato shows how to finish hollowing the hull with a gouge after the centerpiece and the side that is bave been glaced securely together

The planting is represented by ecoring lines with a jackbude and cutting long, shadow growen with a church

dealer. One solid piece or layers of other thicknesses will serve equally well, provided their dimensions are at least 2% by

2 by 10 m, each

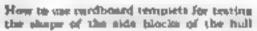
On one ade of each block mark the profiles for cutting. These and other lines may be transferred to the wood by making full size drawings from those on page 68, or, more easily, from the blue-priots, where everything is given in full scale. You can trace the outlines through a piece of typewriting earbon tissue, but I prefer to trace them first on to tracing paper because with this it is so much

Diese lines, but do not cut too fine at the extreme ends, because if the points are bruised and broken, pieces will have to be built in to renew them.

Holding the blocks of wood while working on

them is no trouble if one has a bench vise. One should certainly have a vise for ease in doing most carpentry jobs. If, however, one has no regular bench, it is worth while to buy a small iron vise which may be clamped on to a table. In the absence of a vise of any kind, I suggest cutting a V shaped notch in a piece of plank and fastening it on to the table with a C clamp or hand acrew to set as a stop. Cut a wedge to fill half the notch, then either end of a side block may be held from by by pushing it and the wedge side by side into the notch,

On the amidship or flat side mark the sheer line, this is the curve which makes the ship higher at the bow and stern than elsewhere. Cut to this line, teshing occasionally with the try square so that you do not get lower on the outside than the mark will help in digging out this curve. Note that the stern is a little higher than the bow. The spokeshave is the best tool



for this work. Lacking a spokeshave, one can make a good, sharp jackkings serve for this and most other tasks.

Now lay the blocks on the blueprint or your own full size drawing and mark on them the construction inner I to VII. Carry these lines carefully right around the blocks. From the body plan given on Blueprint No. 01 or the diagrams shown within squares on page 88, make a series of thin cardboard templets. Mark on each the corresponding number,

Grip a block by one end, bottom up, in the vise, or with the flat mids up onte face down on the table and proceed to shave away the outside until the templets fit to it, as in the upper illustra-

tion on this page. Start in the middle and do not attempt to bring the block down to the templets, at their position, one at a time, but shave along the whose length so that they fit almost sum temporaly, thus preserving the long flowing lines with no suiden hills or bollows. Leave enough stock on for sandpapering the

surface smooth.

A SYALL wooden spokeshave (blade about 13/4 m.) is the handlest for this work, but it can be done with a small plane, or even with a jackki de. Note when exiting that you hold the tempets at a right angle to the bull each at its corresponding construction station (I to VII) and with the keel and deck marks coinciding with the actual keel and deck lines. Be sure that you do not cut away anything more from those two lines, which you previously marked and cut so caref dly

These pieces can be roughly hollowed more readily before they are glued to the centerpiece than after. Therefore, 14 infrom the curved edges, along the top and the flat aide, make a pencil mark. Saw down (as suggested in the small illustration on page 88)

Continued in page 88)

You Can Build This Armchair

A Cross-Legged Seat That Is Remarkably Comfortable Inexpensive to Make, but of Rich and Costly Appearance

By CHARLES A. KING

"Hi N we get tired of auto tripping I do hope we can have a camp or hongalow as well manned and furnished as this!" excertied Mistred "I have never sat in a coast that seemed quite as confortable."

She leaned back contentedly in the

roomy folding arms air unit an red at Heen and Yai

"I am glad you like it," responsed Vas. The I had considerable difficulty in personding Helen that we wanted not that kind of chair. Now we both feel that we const have found nothing more satisfactory."

I don't think you could "
agreed J mane Abddrest's has
band. "They are seldom appreciated, yet it seems to me
that no chair is quite so easy to
arop into

"I think," laughed Val,
"that the nun who invented
the chair is a public occupiator
and hope that he has has no
trouble so collecting adequate

remaineration."

"WELL," repond Jonnie, who was an interior decorator, "if he had not
collected Lis just dues a couple
of Luonsand years ago. I fromk
he would have trouble in establishing his claim today, for
these claims are break descendnats of the Roman chairs which
were common before the days
of the Coesars."

"I supposed they were a modern product," and Val. "What is the connection between the Roman chair and

these?"

"You had better not get J'imme started on the evolution of furniture," warned Mildred, "for that is his particular horby and he will talk

on it all night if he has the least encour-

agement

"Good!" ejaculated Helen and Val in

coursel

"fac we are buying pieces as we happen to find them for our new house at Brainers. Now, I mine, we want you to tell us just what a Roman chair is and the process of its evolution to the folding chair."

"West." Jumme replied, "If elegance of design and workmanship were the lasts of evalution. I should say it was a case of devolution instead. As compared with

It is camp chair (A, on this page), the Roman chair (B, page 90) was made of a number of pieces of wood from one and a half to two metes that a shaped to a compound or reverse curve and beid together with an iron rad. It was not particularly a forting chair, but its form easily suggested that adaptation. It was a heavy

Cross leaged activities with appearant leather seat and book, which Val plasmed to make. The working drawings are given on page 91.

This type of folding camp chair, referred to as A in the text, is a lineal descendant of chair 8 on page 90

and clumsy piece of furniture, which was perhaps the reason why, in its evolution to the Italian Remassance, its shape (C) was changed in the direction of lightness and economy of material. Then it became necessary to make a seat instead of merely shaping the legs to fit the body or to receive a cushion. "The type was common in Italy during the middle ages. It is of an called a Dante or Savonarom chair. In one form or another the chair has appeared in nearly every European nation whose entired makers were skilled enough to produce them. We find modifications of the Hisman designs in old Spanish for eture. B) and in Fletnish, German and English, Et anore especially during the Todor per od of the sixteenth century.

"EXCEPTING the Italian process four leavy legs either rigid folding or sen folding. The type received little attention during the seventeenth, eighteenth and fearly nurteenth centuries, which naw the inception of our modern furniture. This explains why you do not see the type in our early American pieces. Designers and cabinetmakers gave their attention to styles favored by reigning houses or the styles of designers and makers who for the time land the public fancy, Chippendale, Reppelwlife, Shernton. Phyle and others. They designed no ferrature based upon the cross-legged motive, though in some cases it was suggested.

"It has remained for modern furniture

designers to rehabitatate the
cross-legged den
in making chairs.
They are often
used in fine homes,
especially of the
California and
Florida types,
where the rough
plastered or plastie paint walls
form an ideal
background for
massive furniture.

"Today we seek for any type which may be adapted to modern needs. For example, look at ther

Here Jimme teached into hat coat pocket and produced a sketcl-book, his inseparable companion. In it were many original

inal sketches and memorands of furniture, including the drawings for the claurs marked F and G (pages 90 and 91)

"While the cross legs of this chair (F)." Jimmie explained, "are halved in the center and fastened together rigidly, the method of fastening the rounds with holts and screws (Continued as page 90)

What's wrong with this Picture?



John and Mary have started on a day's picnic. But with the hard luck that has followed John he has just got nicely started when a front tire goes flat.

OST of the readers of Popular Science Monthly will know what he is doing wrong. The picture shows him wrestling with his punctured tube-trying to patch it with a piece of rubber and some cement. It will take him half un hour or so-and when he does get his tire back on the wheel and the weight of the car on it he may discover, like thousands of others, that his patch doesn't hold air and it may be necessary for him to go through the same awanty performance again within a few miles.

The readers of Popular Science Monthly have helped John and Mary in many of their difficulties. If they were there they would red John to stop in the next town at any place where auto supplies are sold and get a Shaler 5-Minute Vulcanizer Outfit so that the next time he had tire trouble he could make a permonent repair in a few minutes that would last as long as his tube.

Complete Outfit Costs Only \$1.50

Any tite repair man will tell you that to make puncture repairs last you must VULCANIZE with HEAT. That's why more than four million motorists use the Shaier 5 Minute Vulcanizer. It is the quickest and easiest way to fix punctures and make repairs permanent under conditions that would soon loosen any cemented petch—for instance in Balloon Tires. The Outfit includes Vulcamzer and 12 Patches Patch and Heat Units—ready to use only \$1.50 n lettle more in Far West and Canada).

THE SHALER COMPANY, Waupun, Wis., U. S. A.





PRIZES FOR BEST ANSWERS

What's wrong in the parture bende the fact that John is not ming a Shaler 5-Manuta Voicender

To the fifty people sending as the best assures we will give FRLE a complete Jiz 30 Shaler 5 Mmute Vulcarizet outfit with petches.

Completeness, extrectness and nestness are the things on which winners will be judged.

Contest closes June 2, 1927.

Address

THE SHALER CO. Waupun, Waconsin

What My Shop Has Taught Me

How to Keep Bench and Tools in Order and Run a Lathe with a Salvaged Motor Hints on Homemade Furniture

By HAROLD P. STRAND

So MANY beautiful, useful articles can be made with a few tools, from a rough, shaperess siece of wood, that I just can t understant men who profess no interest in building or creating things with their hands. They mass a great deal in a fe

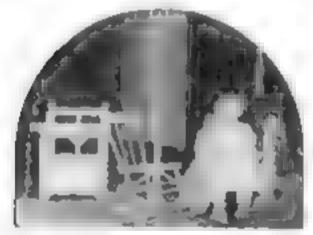
My own deare to build things began early. As a boy of fifteen years, I undertook to construct a two-car garage for a friend. White I had a little help in the framing, the rest of the work I accomplished all alone. I shouged the roof, claphograded the sides, hung

the doors and windows and laid a 2 in.
plank floor. Even today when I happen
to pass the property with a companion.
I take pride in saying

"See that garage over there? Well, I built it myself when I was a kid in gram-

mar school "

After the garage was completed. I cleaned away a corner of the cellar at home so I count pit up a bench and have a little works top. From that day to the



Two toy rockers, a clother rack and a chair made for the author's buby daughter

present my hobby has been my workshop.
I cannot begin to list all that has been accomplished or tabulate the amount of money that has been saved through this hobby. In our house, as in every other house, from ture has become damaged from time to time, a chair has required gluing up, or a table leg has suffered a blow. Perhaps the ten wagon has been left in front of a drafty window and the variath become so checked that the piece

How many too exceptioned doors have been found that needed placing! And countless acrews and rails have been wanted here and there. Then there have always been new things needed that could be made at much less cost than their commercial equivalents could be bought.



his Strand in his trouteshop of Mission. Mass. He is nabiting down on old deak which has just been restored. Note the beach, tool rack and lathe

To derive the atmost pleasure from my hobby, I have found it essential to keep an orderly shop. It is no fun to go to your bench for an evening's work with your mind fill of steam and then to find a congloneration of papers, shavings and tools bying about. The job of clearing up, sorting out scattered tools and otherwise wasting precious base is to me such a discouraging beginning that I lose in a caperness and gest. So I think it is a good plan to spend a little time picking up after the evening a work, even if you have to quit work, a little earlier. Give the next day a clean slate and an unhampered start

THE place for the tools more commonstly used is in a neatly arranged rack at the back of the bench, where each has its own stall. Then a vacant place tells of a misland or lost tool. The tool chest is all right for tools kept to meet unusual needs and for small odds and cods, but it well time can be wasted by the man who keeps all his working implements tucked away in a chest.

To do good work, keep your cutting tools sharp with wheel and stone. Sharpen your naws or have them sharpened when they need it for otherwise they cannot do accurate work. The saws I have are the pride of my workshop. One of my saws belonged to my grandfather in Fingland and it holds its edge and cuts beautifully.

I find it necessary to have a pair of each of these saws: Rip saw, coarse and fine crossed thank fine too to back any compass saw and coping saw. The reason I have

two of each is because on particular work I like to feel the saw out and use the one that appeals to me for each operation. Two saws, even

of the same size and tooth, rarely "han ile" the same, at least that is the way it seems to me. What a tiril one can get from the feeling of a starp, web-set saw cut tang ills way with little effort through a solid, day plank!

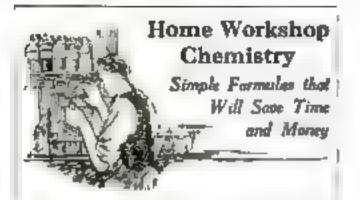
A saw vise, a three-cornered file and a saw set are indispensable. The saws themselves are kept hanging up when not in use, so nothing can cross the teeth and ruin the keen points.

It is a good plan to rub a little oil on them once in a white to keep the dampness from rusting them.

The sharpening wheel I used for years for grinding plane blades, closels and other took was one I made of bicycle parts. The crank hanger was the main drive, with the regular chain driving a sprocket on an old rear whee, the run of which made an excellent pulley. This received a belt, making the final drive to the grinding wheel shaft. The whole assembly was arranged in a hardwood frame with a peat for use while pedaling

Hereatty when the motor on our wasting martine burned out, I bought a new one for the waster and then set out to rewind the old one for me in my shop. I closted the wire as I took at off and findly made a successful job of the feed winding. This isotor was a welcome addition. I have belted it to a wood turning lattle which formerly was operated by foot. [I nationed by page 92]





PROTOGRAPHS may be trated or standed samply by immersing the peints in various salt solutions. In this process the main consideration is absolute eteanliness. All possible sources of pollution must be removed and the prints must be washed thoroughly in plenty of water after being removed from the bath.

As a rule the photos must be blesched before they will take the stain, especially those types of shans which can be made at home. A bleach may be made from 1 gram cupric chlorida in 100 cc. of water (or a teaspoonful of the salt in a glass of water). As soon as the image has faded almost completely from the print, it is washed in water and placed in the tuiting soudion or bath.

If supere el lumde is not at hard. potaurim bichromate may be used-

Makea autorated solution of the salt in water. To one part of this solution add four parts of water and two or three drops of hydrocharge and for cuch glassful of the maxture. Thus is a rapid blesco. but it has one disa lynothge in that



Mining a miniton for Maining photographs

the prints are, at times, tanged a slight

After blenching, wash the print in water. all rwing at to remain for a authorently long.

train to remove the sacts.

A deep coppery tast is obtained on all places that were black, while the whites remain perfectly white, when a copper breached print is desed in smillgol or when dried and then exposed to sanight The abudes produced are permanent.

To outsin a sightly browner tant, the bleached and wasted print is bathed in a solution of 1 gram ferrous sulphate and 10 drops of dilute sulphure send in 100 ecof water, or a half tempoonful of the salt is placed in a glass of water and the acid , ast mentioned is added. Leave the print in the bath about five intintes, then wash, dry and expose to sunugat.

A pleasing sepia tone is obtained in a sun lar way by using a bath made by dissolving one gram of polassium oxalate in \$25 cc. of water, or I heaped teaspoon

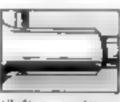
of the salt in a glass of water.

A very dark reddish brown verging towards black is obtained by bleaching. washing and placing the print in the ferrous sulphate mentioned above then washing and transferring it to the oxalate wath

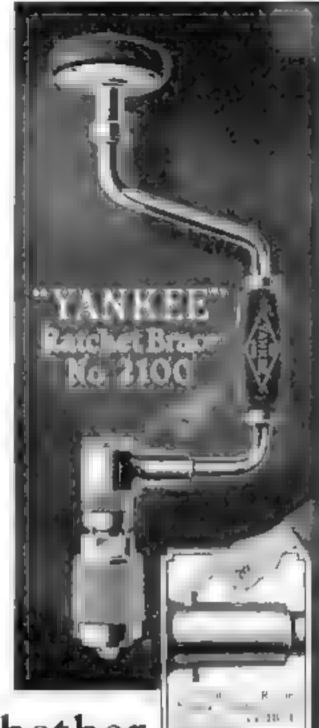
All these processes stars only the black or shaded portions. The whites are not influenced by the starning action. Old photos can be used just as well as new



Shifter position down) for righthand ratchet



Shifter position (up) for left-Total Control



a glance shows whether

on ratchet or rigid

WITH the "Yankee" Bit-brace you do not have to try the tool this way and that to find out which way the ratchet is set.

A glance tells the story: with rotchet shifter centered, the brace is rigid. When shuter is down, the brace is on right-hand ratchet; when up, left-hand ratchet.

You change the ratchet adjustment at a fingertouch—and you

see what you are doing!

The "Yankee" Ratchet is famous for its easy action. Smooth, silent, powerful! Chuck is quick centering, accurate and will not loosen in work. Hard Rubber Handles do not warp, shrink, crack

Try the "Yankee" Brace at your hardware dealer's. You will see the economy of owning the finest tool of its kind. Ask him to show you the new "Yankee" Bit Extension.

Some Other "Yankee" Tools

Spiral Screwalchers. Plain Screw-driven Automatic Push Drills

Automatic Ford Bench Drills Extend Tap Weenches Vises- Removable flute Ratchet Broast and Hand Dr Its

Dealers Everywhere Sell "YANK! F" Tools "Yankse" an the tool you buy means the atmost in quality, afficiency and darkfilty

Write for FREE "Yankee" Tool Book

This interesting little book is for all lovers of fine Tools. It tells just what you want to know about all the famous "Yankee" Tools for making work easier and quicker

NORTH BROS. Mrc. Co.

PRILADELPRIA, U.S. A.

IKEE"TOO!



Easy Ways to Do Recessing Jobs

Chucking Work Quickly in a Turret Lathe—Using a "Pull" Cut to Avoid Chattering—Hints on Facing

By Albert A. Dowd

HESE custings have to be recemed," saul the machine shop foreman one morning to young Harvey Smith. "The original blueprint showed a straight hole, so we reamed them all to use, and now the engineering department gaves me a blueprint like thus (A in Fig. 1) and tells me to receas fifty of these pieces. You'll have to hold them in a four-yaw independent chuck or set them on a short plug on a faceplate so the inside hole will run true. See what you can do to hustle the job out."

The foreman walked away and Harvey looked doubt-filly at the blueprint, It called for a recess is in. deep and 1% long, inside the previously reamed hole. Then he picked up one of the pieces, which

were of east iron, unfinished on the outands and faced only on one end. As he stood there thinking it over, Mr. Grines, the efficiency engineer, came along.

"Anything of interest this morning?" he asked cheerfully.

"Not much," the young machinist replied, "only the foreman just gave me the job of recessing these castings that have already been bored and reamed. I've got to get the recess somewhere near concentric with the other hole."

"HOW are you going to do that?" inquired Granes.

'Oh, Tom said to put a plug in a faceplate or hold them in a four-jaw chuck. He daen t seem to care now I do the job. I think I will use the four-jaw chuck on the lathe here, put a



Harvey pointed to a fool that was lying on the beach. It was similar to B, Fig. 1.

plug in the hole and undeate it and then born set the recess with a tool like this."

SKETCHES sucular of the second of the second

Fig. 2

for Harvey a benefit

Fig. 3

"I would have to turn up a plug of the right size," he continued, "and fit it to a sixteen-inch faceplate and then rig up some clamps to hold the work of I do it the other way, and it would take me two or three hours to get started."

"Why don't you do the job on that idle turret lathe over there?" suggested Grones. There is a four-jaw clock already on it and I can tell you a faster way to do the work than either of those you

have mentioned."

THE engineer made a quick explanatory sketch (Fig 2)
"See—just get a bar B, one and a ball inches in diameter, and put it is holder C on the turret. Ship your casting A on to the bar and move the

turret up until the work is up against line face of the chuck. Bring up your chuck paws independently to grip the work and then pull back the turret out of the way

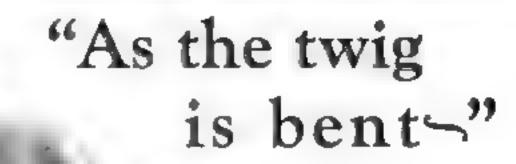
> You can easily mount a recessing tool at D and then go right ahead and machine the recess.

> "That's a great scheme, Mr. Grames," exclaimed Harvey enthusiastically.

"Yes, and you can apply the same idea to other jobs new and then when you have an opportunity."

"What about recessing operations?" asked flarvey "Is there anything particular about the way the (Continued on page 160),

MANY time-enving shop ideas are contained in the continuation of the Better Shop Methods Department, pages % to 103.





Starrett Apprentice Set No. 900 in a handsome folding leather case contains a 6 inch Combination Square complete, Center Punch, 6 inch Flexible Steel Rule, Center Gage, 4 inch Caliper, 4 inch Outside and 4 inch Inside Calipers with solid nuts, and 4 inch Dividers with solid nuts.

This Set and the Starrett Book for Machinists' Apprentices, Volume 1 of the famous Starrett Books, gives a fellow a fiving start.

Ask your dealer. And write us for a free copy of the 352-page Starrett Catalog No. 23"W."

If you've "been through the mill," you know what it means to a young fellow to start with the right tools. There isn't anything that'll help him more than a set of fine precision tools—Starrett's. Give him a Starrett Apprentice Set, No. 900.

If you're just beginning, here are the tools you need. It's a kit that you'll be proud to show any man, because they're all Starrett's, the tools that two generations of American craftsmen have accepted as the standard for quality and accuracy.

THE L. S. STARRETT CO.
World's Greatest Technology
Manufacturers of Hacksons Unespelled
Soul Tapes: Standard for Accuracy
ATHOL. MASS



Love Sends Convert to Pipe-smoking on Tobacco Hunt

Of course a young man in love will do anything to win favor in the eyes of his lady fair. And pipe-amoking seems to be one of the credentials that admit young male America into the graces of the fair sex.

But while smoking a pape seems to solve the femining problem, finding the right tobacco evidently is the male problem.

Probably that is what prompts such lettors an this

> New York, N. Y. June 30, 1026

Lanua & Bro. Co. Rechapment la b Lientinumi

I started employ on eigerettes, but after over up of long lady for whom men who resolves poet one a greater charm, I primarely switched of me. Ther my spony began. I tried me brand of telegraph of the primare of the

Ther my agony tegan. I tried one brand of tobarro after much her, assess a manage on he theory that the man you pust for bothers, the better a grands be.

Then came the day I tred Edgeworth It was at a less taped. I had run short of the pertain brand I was emoking, and a resonal acquisitions offered me a posture. Imagine my shright when after the first few paffs. I did not feel the old tambur late. I nuffed on, planning the design of a room, and o, tery! It was sweet right those to the tactors.

them to the test ten. Noting the mean agent by Sutling his experiented the from try police, or my paper truly followers his research

Yours very touly. (signed) David Freedman, Jr.

Let us send you free samples of Edgeworth so that you may put it to the pipe test. If you like the eampaea, you'll like Edgeworth wherever and whenever you buy it

> for it pever changes in qual-

Write your name and address to Larus & Brother Co. 10-P S. 21st St , Richmond, 1 m.

We'll be grateful for the name

and address of your tobaceo dealer, too, if you care to and them.

Edgeworth is sold in various sizes to built the needs and means of all porchasers. Both Eogeworth Plug Siee and Edgeworth Ready-Rubbed are packed in small, pocketmie packages, in handsome humidors bolding a pound, and also in several handy isbetween macs.

To Retail Tobacco Merchants: If your jobber cannot supply you with Edgeworth, Latus & Brother Company will gladly send you prepaid by parcel post a one- or twodesce cartes of any size of Edgeworth Plug Slice or Edgeworth Ready-Rubbed for the same price you would pay the jobber.

Du your radia turu su an WRVA Rathermed, Va. 1
the Edgeworth Station. Wave length 15th meters. 1

New Uses for Plastic Paints

(Continued from page 69)

Many striking effects may be obtained with the fingers, as as this sample scroll testure

plaque (the rectangle with the lim on it; you can see it if you look closely) were amouthed down with the trungle and the whole was allowed to dry.

The next step was the application of the hon in the plaque and the deur-de-lia in the two top cornerstones and out near the edges of the fireplace on a line with the plaque. These were made with uncolored plastic paint applied through

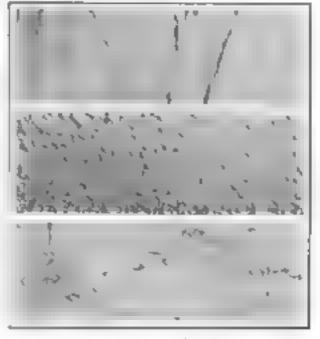
stencils bonght at the parat store. Then the joints were acored to produce the effect of stones with a common file bent at right angles to the tang or han-lie end. A yardstick and ruler were used to keep the acoring straught

Next day the whole was randpapered lightly with No. 1 14 sandpaper to remove rough edges. A

max of a half pound each of rottenstone and size was made and applied with a Dutch calcumne brush. As the mix was applied with the right hand, it was wined off with a noft cloth held in the left. Thus it stayed in the depressions and joints hert was waped off the high spots, and gave the whole the rich finish of old stones. Thus completed the job, all but coloring the lion in the plaque which was done some days later, with raw mober (artists' oil color), wiped partly off

Now to return to the decoration of the other three rooms and the hallway:

The furniture in the bedroom that Eleanor and I share was given to us by Eleanor's mother, who had it as a westing gift from her mother. So it is quite old. The design of all the pieces is bravy and substantial, more English in character tion anything else, so we decided on a rough texture arianted from those found in



Developing a travertine finish. Greenpar so blown on the pount after it is stippied

English cottages and a shade of about beach sand for the color. Of course, we first made the usual test panel on wall-

In this bedroom the walls were covered with wall paper, so we had before us the same job that had confronted as in the during room. We removed all the oid paper, washed the entire surface down with a solution of sal soon and bot

> water and then filled such cracks as there were with the cement that at used in the application of plaster wallboard,

> Yellow achre was the color muzed, first with water in a separate pan, and then with the plastic paint. The mix was brushed on to the wall in random aweeps. The English texture was produced with a

4-m. semiflexible putty kinds. This was drawn over the wet paint in mich a manner that welts appeared on either side of the kade, the extent of each aweep being

about an eighth circle.

The material for the ceiling was mixed shout two shades lighter than that for the walls, for a ceiling of the same shade would have appeared darker than the walls in the finished job. The ceiling texture comply was a brush texturethe paint was brushed on and left as was.

TUNIOR'S room was next. It originally J had been decorated with calcinate. For a sturdy up-and-about youngster, James has a lot of consideration for walls. They were in virtually perfect condition, and all we had to do to prepare the surface for plastic paint was to wash the calcomme off and let the walls dry thoroughly. We felt that Jumor would most appreciate a gay and cheerful color, so we decided on salmon. And we also felt that a povelty texture would interest the young man most, so we chose a finger neroll, which is developed with the tips of the fingers.

To color our plastic paint we used hurst seema and yellow oclire in const proportions. The paint then was brushed on the walls in the usual manner and the scroll texture was produced by drawing the tips of the fingers through the web n sterial in a write even dur motion. The ceiling was finished in a lighter shade and in the brish texture. After the walls had thoroughly dried, the few too-large welts that had turned up from under the tips of our fingers were sandpapered.

This left the guest room and entrance hallway. The guest room had wall paper on the wall. This was removed and the walls were treated as they had been in (Contraved on page 79) Elepnor's and my

Plastic Paint Decorating

(Continued from page 78)

room. The texture selected was a brush finish and gray was the color chosen.

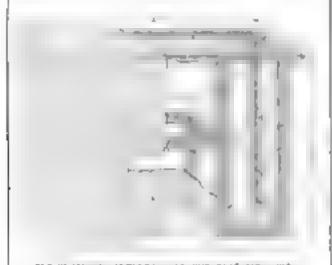
To get our gray color, dry Swedish black was mixed and added to the white plastic paint. I have since learned that dry lampblack can be used if it is first mixed with alcohol to cut the grease

A plant brush texture was used on the walts and ceiling of this room.

the entrance ballway was the next point of attack. We selected a finish of initation travertine marble.

Now this effect really is sample to prudice. Every step in its development is shown in one of the illustrations except the blowing in of the greenspar-a sand from Florida's beaches.

First, the plastic paint was build with the sicilia to approx mutely a neet creatic. It then was applied to the walls and stupled with a stippling brush. Next.



TOP IF HAM BY EXTENDS - MERSHO BASE ARE WIES How the fireplace framework is built and covered with wellboard ready for finishing

the greenspac was blown in sneply by placing the powdered material on a sheet of paper holding the paper about a foot from the watt and blowing the greensparoff the paper and on to the wall. A uraltenum a triangle -the one used in making the fireplace—was drawn across the surface in such a way as to smooth down most of the stopples, the pits that remarked completed the effect of true Iravertine atone. After the wall had thoroughly hardened, it was sandpapered. with No. 1% sandpaper and the stones were marked off as on the ficeplace. A coat of size completed the job.

Plus effect was carried all the way up to the easing, which was finished in a orush texture and a cres a color

Thus, we completed the redecoration of our house. But we ware by no means drough with plastic paint

The first idea I had was derived from an illustration in the public section of our Sunday newspaper. The illustration was from some movie and showed a pirate on a sea beach, standing beside an old brass-bound cliest, evidently a treasare chest. The clast was picturesque and I knew that one like it would be a good ornament for our living room or hall.

I needn't go into detail about the actual making of the box, but after it was made, it was necessary to treat all the joints with the same reinforcement used in building the fireplace

The next thing (Contributed on page 81)

"I Wonder How He Knows So Much!"

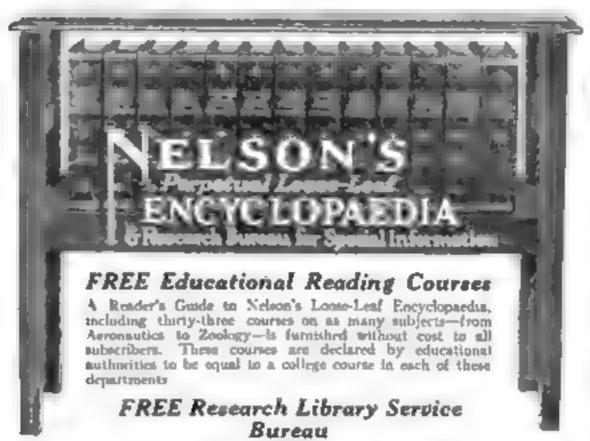
How many men do you know who surprise you by the wealth of their general knowledge. and information on all sorts of subjects—history, hiography, travel, politics, business. sports, and a thousand other things? If you were to inquire, you would find that these men make a habit of consulting an up-to-date Encyclopaedus. Here they have access to the knowledge of conturies—concise and plainly stated, easy to group and remember. Through the constant use of the Encyclopaedia they are familiar with all the things that people talk about.

Get Your Facts from Nelson's

Every subject on which man would be informed is changing constantly. Nine times out of ten, the information you want is the information in oday. While the exception of Yelson's Loose-Leaf Encyclopaedia, all encyclopaedias are deficient in this important and necessary thing

Because of its patented loose-leaf device, Velson's Loose-Leaf Encyclopsedia can never grow old. It is always new and up-to-date. It covers the entire field of knowledge from the dawn of civilization to 1917. Every six months, new pages (250 or more) are sent to every subscriber to take the place of those that have become out of date. This method keeps. Velson's Encyclopaedia accurate, reliable, and up to the minute in its anlormation

THE BEST ENCYCLOPAEDIA IN THE ENGLISH LANGUAGE



FOR MILITURE REPORTS AND SPECIAL INFORMATION AND CORRE-SPONDENCE: Every purchaser of Nelson's is entitled to free membership in this Bureau II at any time you are in doubt on any subject, old or new, write to this Bureau with the positive assurance that you will grow pily receive the latest obtainable and most dependance information

THE GREAT AMERICAN ENCYCLOPAEDIA

Dodleated by Permission to

CALVIN COOLIDGE, President of the United States

NELSON SPERPETE AT LOOME LEAF ENCYCLOPAR DIA - the Great American Reference Work. The Editor-in-Chael in John H. Finley, Editor, New York I mes,

The Canadian Editor is Sir-Robert Falconer, President of the University of Toronto, the European Editor of Sir Heasy Newbolt. The staff of contributors in cludes men and women foremost in Scientific, Professional and Public Life who are themselves making

THOMAS NELSON & SONS Publishers Sixos 1798 381 Fourth Avenue New York, N. Y.

THOMAS NELSON & SONS

Publishers for any 1 or

Originature of the Loose Loat Reference System 281 Fourth Ave., New York City

Bease end me wast portfolio of sample pages se in 6 by flus-The state of the state of the features of the action of the state of t no obligation whitever on my part.

Address

Stute

1dy Capyright, 1927 by Thomas Nelson & Suns

A Few Minutes

with Rogers brushing lacquer

You give a shabby chair a new coat of brilliant color. Thirty minutes later it is back in the living room ready for use

Like a fairy wand, your brush of Rogers Brushing Lacquer works magical transformations. Shabby things become works of art before your eyes

Irksome preparatory work is gone. Experience is unnecessary. Merely dip the brush deep into the rich "Rogers" color. Apply it freely make over the old flush. "Rogers" covers perfectly. Flows together in a smooth, lustrous coating. And then it

Dries while you wait!

Dries in thirty minutes. Dries in time for most urgent needs. Dries without laps or brush marks. Dries before dust can mar its sating sheen. Dries before damage can come to it. Dries to a hard porcelain-like finish that wears and wears and WEARS, that does not print, that does not gather lint.

There are literally hundreds of uses for this amazing new home lacquer in every home store and building. Adheres to unfinished wood, to metal, glass or any old surface. Anyone can apply it.

Dealers everywhere sell Rogers. Comes in cans ready for use, in 18 charming colors. Also black, white and clear,

Be sure to get the genum. Rogers in the "Oriental" can, the kind sold everywhere on a "Money-Back" Guaranty.

DETROIT WHITE LEAD WORKS, Detroit, Michigan Makers of Highest Grade Paints, Varnishes, Colors, Lacquers



BRUSHING



Our "Money-Back" Guaranty

Try one can of Rogers Brushing Lacquer. If not more than taushed, return what is left to your dealer. He is authorized to refund the entire purchase price

Also distributed and guaranteed by

Acus Winte I sad and Color Works Detroit, Michigan

LINCOLN PAINT AND COLOR COMPANY LINCOLN, NEBRANKA

THE MARTH-SEROUR COMPANY
CHICAGO, ILI-INOIS

PERSSULAR PAINT AND VARNISH COMPANY DETECT, MIGHIGAN

THE SHERWIS WOLLDAR COMPANY CLEVELAND, OND

DRIES WHILESYOU WATT



DRIESEWHILESYOUSWAITS





save money -have lots of fun, too

WITH a Harley-Davidson Single you can get to work and back, run errands, and ride around evenings in half the time you would spend on street cars or busses. And at far less cost! One cent per mile! On week ends and holidays you will get a world of pleasure out of the healthful outdoor sport of motorcycling. It adds a new joy to vacations, too.

The Single is easy to ride and control—safe. Parks in any 2x8 footspace—convenient. Travels 80 miles on a gallon—economical. Powerful Ricardo-head motor.

Easy to buy, too. Ask your Harley-Davidson dealer about his Pay-as-you-ride Plan. Price complete with 3-speed transmission and full electric equip \$235 ment, f. o. b. Milwaukee

Mail the coupon for literature.

HARLEY-DAVIDSON MOTOR COMPANY
DEPT PS. MILWAUKER WIS.

Big sales opportunities in open territories.

HARLEY-DAVIDSON

[New-Type | Single

Motorcycle.] Single





Plastic Paint Decorating

(Continued from page 78)

we did was to cover the whole box, except the bottom, with a thick cout of uncolored plastic paint. This was streaked and swirled with the brush to reproduce the grain and knots of old wood. After the paint had dried it was sandpapered lightly.

NEXT, stencils were cut in common stencil paper for the hinges, flanges and locks, and the ploatic paint was applied through the stencils with a 4-6, seem flexible putty knife to a this kness of about 1/4 in. To give these imitation langes, flanges and locks the appearance of hammered iron, we tapped them at random with the end of a pencil. This method was satisfactory enough, but I am now convinced that a better effect can be obtained with a suppling brush.

To make the corner bands, bottom bands and lid bands, we stick adhesive tape on the box about 1 in, out from where the bands were to be. This gave us a "deadline" and kept our bands strught. The plastic paint then was applied with a putty ki de to a thickness of 1/4 in, and I ammered with the end of a pencil When the bands had dried they were aghtly sandpapered and the adhesive tape was pulled off. Brass-headed tacks now were placed in a vise and dented with a baronier, then haded into the "iron work."

Every pirate chest that is worth its salt has wormholes in it. So we put wormholes in ours—with an ice pick.

TO MAKE the front hanges, a pencal was broken in three parts, each part was dipped in plantic paint and then stack on the box. When dry, the hanges were sandpapered lightly and scored to complete the hange appearance.

Next, the whole box was coated with oak stain, which was wiped off lightly with a cloth to produce high lights and stadows. When this was dry the chest was given a coat of clear variash and while the variash was atol "tacky" the box was dusted with rottenstone, the excess rottenstone being wiped off. The surface now resembled old wood the next step was to finish the "iron work."

To the finages and similar parts, a

coat of abnormin paint was applied. When this and dired, lamphlack was mixed with a small quantity of varnish and applied to the "iron work" and wiped off with a soft cloth. This left the black in the depressions.

The job was now finished but for the handles. Ours were handlesed out of a piece of tin with a cold chisel and then treated with aluminum paint and lamp-black and varnish, but I wouldn't recommend this method. Handles of many sorts, antique and otherwise, can be purchased, and they will serve as well as those we so laboriously made.

I could continue on and tell you how candiesticks were given an individual finish and texture with plastic paint, how vases and howls and trays were made; how panels were stenciled and hing as pictures, but I might be robbing you of some of the fun that comes from working out such problems for yourself



To "Show Me" Fellows

Let us show you that the claims men make for this unique shaving cream are true

-Accept, Please, Full 10-Day Tube to Try

GENTLEMEN

When salesmen call on us, we give them a courteous hearing—then ask for samples.

And since it is a poor rule that doesn't work both ways, we sell Palmolive Shaving Cream on that basis. We think you are entitled to a testable sized sample before you try it

Will you accept one—a full today tube? We II thank you for the opportunity

60 years of soap study stand behind this creation. It embodies the expressed desire of 1000 men whose supreme wishes in a shaving cream were asked before we started it. Our whole experience as soap and skin experts, as the makers of Palmolive Soap, is embodied

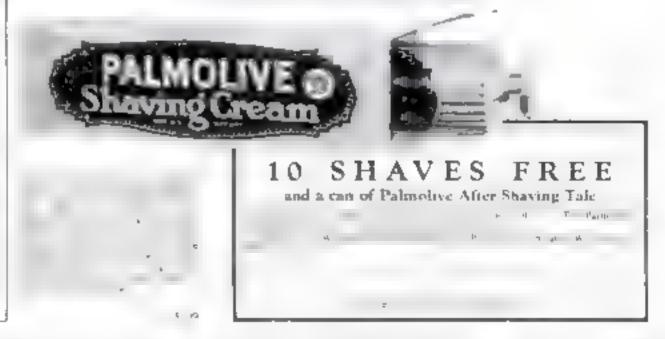
5 new advantages

- t. Multiplies itself in lather 250
- Softens the beard in one minute.
- 3 Maintains its creamy fullness for 10 minutes on the face
- 4. Strong bubbles hold the hairs erect for cutting
- Fine after-effects due to palm and olive oil content

Just send coupon

Your present method may suit you well But still there may be a better one. This test may mean much to you in comfort. Send the coupon before you forget.

THE PAIMOUVE COMPANY De Gare CHRIAGD LE





Strop your blades and put the saving away for a rainy day

Perhaps you don't realize how much you spend for blades in a year. Figure it out some day—the total will surprise you.

Stropping will save a big part of it, for stropping not only puts a much keener cutting edge on a blade but keeps it keen indefinitely.

Here are the cold facts from a Certitled Public Accountant-

"I shave practically every day, therefore my Twimples has stropped a blade over four thousand times. If I had used a new blade daily, as I had to before I bought the Twinplex, at 74 cents for 10 blades, I would have paid out at least \$300.00 for blades. But with the Twinples, a blade always facts at least a

week, and some two and three. I have had fine, emonth shaves, better than the new blade without atropping for sess than \$10.



But the saving is only half the story. If you've never used a NFW blade attopped, you've never had a really good shave. Take this opporturnity to get one.

Stropped NEW Blade Free

Name your razor and we'll send you, free, a NEW blade stropped on a Twinplex We would hise to show you what neal

All deplets are authorized to sell you a Twinplex on 30 days trial. If after four weeks of marvelous shaving you are willing to forego the comfort and economy you have enjoyed, give up your Twinnless and

get back your money. If you can't find the model you want, write us.

TWINPLEX SALES CO. 1757 Locust Street, Saint Louis New York Montreal London Chimes

Stroppers ...

Tops Made of Spools and Clothespins

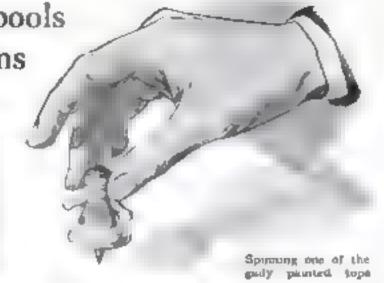
By F. CLARKE HUGHES

KNOB ends ent from ordinary clothespins and sections from thread spools are the materials necessary for making the tops disstrated. All four types of these quant little 'conneils' may he made by combining the same materials in different ways. As many other styles may be con-

structed as there are spools and clothespairs from which to make them. The ones that are low and broad span the best.

The sections of clothespins and spools may be cut with either a kinfe or a saw. He careful to have the ends square. When these are glued together. the arms, cap and spinille are added, as suggested in the algebranes.

Or ly clear, bright oil colors, or fine.





brilliant enamels aboutd be used for finishing these attle tops. Use pink or firsh tasts for the face and arms, black for the nair and spinche, and any pastel slandes for the costone. The under surface of the spool is painted white. A act of three tops wid be much apprenated by any anuli etc.d.

Next month-a clother-pin fly

How to Replace a Flush Electric Switch

By GEORGE A. WILLOUGHBY



MODERN types of elec-tric switches and cover plates often will improve the appearance and convenience of a highting installation out of all proportion to the moderate cost of the materials which must be purchased to make the

Whenever you have to replace an old flush switch, either became it is shabby or has become defective, the necessary steps are as follows:

burst, remove the cover from the old switch by taking out the two screws. Second take out the screws with which the wires are connected to the switch and remove the switch had by from the outlet hor. Third, remove the terminal screen from the new switch step them. through the loops on the ends of the

wires, and replace them in the switch Fourth, put washers, which are furnished with the switch, on the screws, if necessary to bring the surface of the switch flash with the pinster, as shown to the upper illustration. Then fasten the switch in the box and adjust. it to a vertical position. Fifth, attach the new cover plate.

Open the main house switch before doing any of this work.

more swor is shown at the regot

WINS 1st PRIZE



MAYFLOWER

The Ship that brought the Pilgrims to America

Som: Height 25", Width 9", Length 27"

SANTA MARIA

The Flag Ship of Columbus in the Discovery of America in 1492

Suor Horght 25", Width 11", Longth 27".

THESE MODELS CAN BE ASSEMBLED IN A FEW HOURS

RS. CLARRAH J. BIERBOWER of Philadelphia wens first prige in Science and Invention Model Contest. The parts for the ship model entered by Mrs. Bierbower are supplied by miniature ship models at a coat of \$4.98. The model entered was the same as the Santa Maria" pictured above, no extra parts were added to those supplied by us.

This is the first time that the Grand Prize has ever been awarded to a woman. You can build a prize winner from parts supplied by miniature ship models

We, the world's largest builders of ship models will bely you build a prize winner by supplying all the parts out to fit, and ready to assemble for either the "Santa Maria" or "May finers

List of parts supplied for "Santa Maria" Space does not permit describing the parts for Mayflower but it is just as complete in every detail. Hull and keel, 3 pieces, rudder,

A Pleasant and Profitable Pastime for Everyone

Thousands Being Sold Everywhere at Astonishing High Prices

Order Your Prize Winner Today

MINIATURE SHIP MODELS

3818-20-22-24 BARING ST. - PHILADELPHIA, PENNA.

rudder support; 6 hause pipe rings; 6 cannons, 6 port shutters; it shields, front and poop deck sides; railings; upper dock with decorated stern; colored picture for atem, rigging channels, anchor; lamp and bracket, crow's nest, bow spret and yard arm, 3 masts, fore, main and mizzen, spanket boom, jib yard arm, fore mast yard arm, main sail yard arm, top sail vard arm and lateen sail yard arm; wire for sails, brass name place, rigging cord (light and heavy); brads, staples, glue, pullies or blocks and falls, rear balcony; rear balcony raitings, iide balconies, iide cabins, flags, ladders, 18 bumping strips, 11b sail, fore sail, main sail; top sail and mizzen sail, stand, 3 pieces, over hull and parts are made of wood. This is not a cheap cardboard imitation. Shipping weight, 6 pounds. All Canadian and foreign orders must be accompanied by Money Order for \$4.98, plus a sufficient amount for Parcel Post charges

MINIATURE SHIP MODELS

3816-20-22-24 Buring Street, Philadelphia, Penas.

Pieuse send me the completed parts, cut to bt, and ready to assemble for the Model

I will pay Postman \$4.98, plus postage a few cents,

Please Penal Name and Aldrens Plansly to Arend Dilley

NASCH

STREET ON R F D

City_

STATE

PS



"That's how I feel bout the new Cheney Finishing Hammer. Haven't used it very long neither, but long enough to know it's a heck-uva fine hammer.

"Lookut th' slender hickory handle on this Cheney, Just what I've always wanted for finishin' work. It's light and easy to grasp and has a spring in it that makes it rebound from the nail in great style. 'N this high crown on the business end of th' Cheneywhy I never find any of th' usual hammer marks on my finishin' WORK.

"The Cheney's a great little Finishing Hammer, all right, 'n I wouldn't swap it for a dozen other hammers!"



A Strong Joint for Boxes

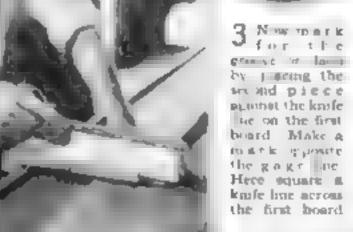
How to Lay Out and Make a Tongued Corner with Backsaw and Chisels

By EMANUEL E. ERICSON



The harm beat a general state out to be and imper a length to the control of the

2 Gage in the hire has an interest of the board with an arms and on arms edge. Next square a write line on the board in in from its end



4 the a sectory saw for the constant for the constant hold the work firmly, as on a bench hook. Saw right to the middle of each kinde line and on the proper ade of it Stop sawing when you reach the correct depth



6 The joint should go together with the pressure of the hands, if it is too tight, it is apt to burst. Glue the joint in any but rough work, and pail the parts together securely

5 While nome tony prefer to thus the tongue or tenon with a reputer, I find it easier to use a fairly wide chisel. For the corresponding groove on the other board, a narrow chisel must be used. Be careful not to man the edges of groove





How to Thumb-Slot Your Phone Book

By ARMSTRONG PERRY

ONE of the annoying experiences in his is to try to find a name in a telephone directory, when time is money or when the loss of a manute may mean the loss of a train. A man in England is reported as making \$5,000 a year by



going from office to office and house to house thumb-slotting telephone directories at two shillings each.

All the equipment needed to index your own telephone directory is a halfinch gouge concave chisel), preferably with an inside bevel; a harm or or mallet, a rubber stamp alphabet with letters of a size to go within the semicircular slot made by the cuisel, and a tion board.

The board is laid between the pages of the book where the A section ends and the B begins. The gonge is placed at the edge of the front cover near the top, and driven through the paper to the board. The board then is placed between the pages where the B's end and the C's begin. The gouge is placed below the first slot and a similar slot is cut. The process is repeated until the bottom of

the book is reached, Seen your

name and

FREL Book

Paul Lour

Automo-

If the whole alphabet has not been covered, the slot for the next letter is cut at the top of the book, through just enough leaves to give room for the thumb. Thesecond row of slots should be alternated with

GOLAGE STAMP
TEILS
WOOD SLUCK
THUMB
SLUCK

The method of curting and lettering the slots

the first row. This should be planned carefully at the start.

In directories containing the lists for several towns, the slots may be arranged according to towns.

When the slots are all cut, the rubber stamp letters can be placed.

City directories, dictionaries and other reference books may be indexed in the same way.



with Kyanize Motor Car Enamel —the quick, easy, safe way

YES, sie, you can do it yourself! Any man, or woman for that matter, who can wield a brush can make new and keep new the foush of an old car. Kyanize Motor Car Enamel will do it. Mixed, ready for instant use, you flow it on with a good clean brush over the well-cleaned surface, give it a day to dry and proudly exhibit it as a new Car.

Nothing in mix, nothing to add, levels itself and

Nothing to mix, nothing to add, levels itself and leaves no brash marks, ridges or laps. Destr hard in less than 24 hours. Wears and shares like polished metal. Water and weatherproof

On at mire-time above the home, min, on perch and parties familiare, toys, from, conservant a humbal other place.

For embass, ups and aphabacy me Xyarias Tap and fast Drendug—a worthy compassion to Systias Motor Car Santiel.

BOSTON VARNISH CO., 722 Byenet Station, Boston, Mess., U. S. A.

\$1. Trial Offer. If your dealer cannot supply your send us his name and ONE DOL LAR for a full pint can Kyantze Motor Car Ename! .state color deared or Leather Top and Sent Dressing state which, together with a good brook to apply We'll also include a cupy of over book. How to Paint Your Antomobile "Culum Black, Red, Because Green, Coach Blue, and other colors.



HOW TO

PAINT YOUR

HITOMOBILE

STAR HANDY GUIDE for HACK SAW USERS ★ HAND BLADES Marerial to be SPECIAL PLEXIBLE FLEXIBLE BLADES **DRAIL LISA** cuc Order No. No of Touth Longth Longth Length 12° 4145F 14111111 **8147** 614 14 14 14 9)45F Large Mock HIGF Ä. 1914 1214 15. 4. 9,000 1,4SF 10 **经验证** 41MF 414 Ordinary Work 111 14" 25F 12185F 10 10 12 10 or General Use 1216 14 M 34 M 4. 81 424 はははは \$245F 424F Pipe, Drill, 10° 101.0 H24 1224 STATE OF Places, etc. QUSF 1245 61 0334 10 H 20 102 Thin Pipe **OBF** Light Sheets, etc. 14225F 1432 1432F 1227 1232 **★ POWER BLADES** HEAVY-ALL HARD LIGHT-ALL HARD Length Longith Gange ha 217 242 442 14 19 10 111 캶 Ordinary Work or General use 1210 Light Structural ESTA. Shapes, Pipe, etc. 14" 14" 14" 413 6 All Hand Blades ory 23 gruge-except Spor Heavy Structural re is cist No 6428 for Lorge Shaper and Sawing LUIS Stock which to 22 grupe. 14158 Lurge Solid Stock

For fast cutting I use Star Hack Saw Blades"

Says G. R. SALTER, Maplewood, N. J.

points of the

- CLEARS NEXPERTS NOT 125 years of the combined experience of the Chausen Family
- 1 T S SERION BUTTER, Repetite This paint Butter is exact specified from an ecorect than ideal of the problems.
- C. Aktion The THE The correct angle and countries guillet of the teeth in a three the brain main. Cut ting ability. https://doi.org/10.1007/j.j.
- Completely men that the test is a thanner for that that the proper clearance to keep the out free of cutys.
- A C1-5180 V Tenter of The hearst reading methods used give 4. At the easen extract to have degree of alreagets, hough-pess and uniformally CI-MBON TEMPER

Every STAR Blade is branded with a STAR

"VOUR Star Hack Saw Blades are miles ahead of any blades I have ever used or seen and I surely do sound their praises at every opportunity. It is a treat to be able to saw a piece of conduit or cable without having a blade snap off. They clear the cutting channel and operate very smoothly-for fast cutting you can't beat Star Blades."

Different Blades are required for different types of machines. Be sure you are using the right type of blade for the work you are doing. Write Hack Saw Blade Headquarters for full information as to the blade you should use to get the greatest speed and efficiency in your production operations.

Let us med you our large back any chart to be placed an your wall for handy reference

HEADQUARTERS FOR HACK SAW BLADES CLEMSON BROTHERS, INC. MIDDLETOWN, NEW YORK

A Built-in Bookcase for Your Bedroom

By EDWIN M. LOVE

WORITE books that find their way into one's own room for the pleasant pravacy of bedtime reading may be kept accessible, yet reatly in order, by the use of the small buist-in bookcase illustrated The construction is very margie, and it can be uscalled merely by cutting out a teclangle of plaster between two strain upr got wooden wall supports). Thus no floor space is taken. The depth of 5 by inaffords enough room for the average novel or other relatively small book.

The materials needed are a heard I by 6 us by Mift and another I by S o by Sift, gone, surfaced four soles and sanded, 1 piece 3-2-3a, quar er-round molding, B ft long, and 4 par of shelf houses.

Smooth up and plane to a width of 5 1/4 in two pieces of the 1 by 6 an pine, 2 ft. B



Even in the unsilest bedroom there is room for metalling a next sittle books use this

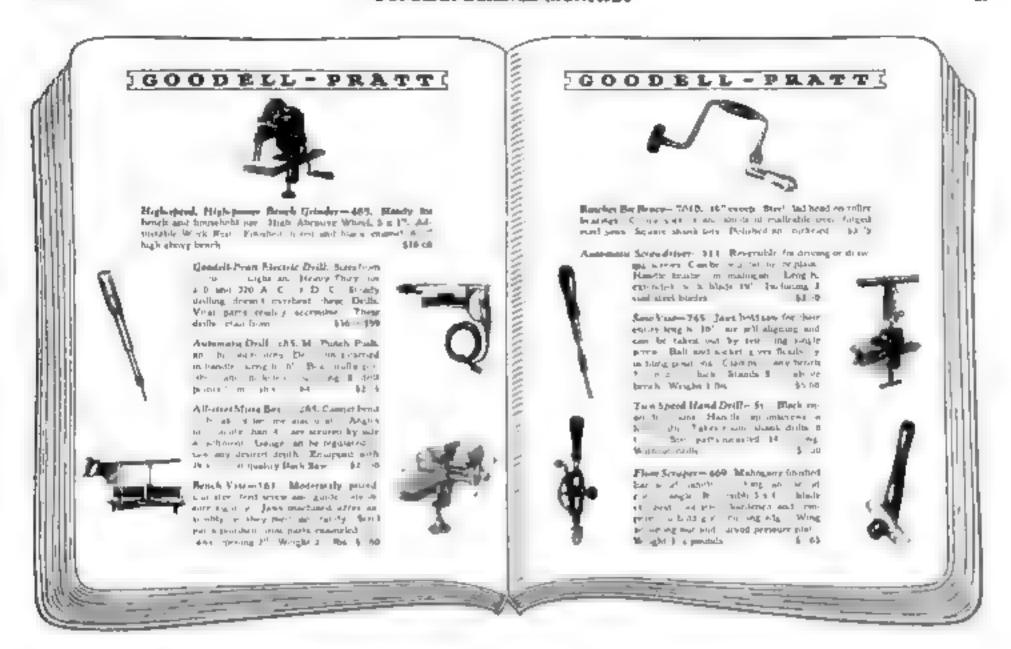
in, long. Square a line across 1 in from both ends of one piece, giving an exact distance apart of 2 ft, 6 in Gage a line around the ends 1, in from the face and saw out the rabbets for the apper and lower pumbs (see the shustration on the following page). Use this prece as a pattern for the other mde.

Gage light pencil lines I in, from each edge, and, centering on these, bore 14-in holes by m. deep every 8 m. along the sergth. These are for shelf hooks.

Make an upper and a lower jamb of 1 by 6 m. stock, planed and cut to 5 sy by 12% The two sactives are like them, but 12 instead of 14 % in. long.

For a back, cut a rectangle of \$6-sn. S-ply panel veneer 13½ in, by 2 ft. 7½ in, A sheet of heavy fiber wallboard may be used instead of the plywood and, of course, will cost less.

Assemble the sides and the end jambs by making through top and bottom jazzba into the sides with sixpensy finishing hads. First clamp the sides against the ends of the top and bottom jambs to msure snug joints, (Continued on page 94)



Site on earning and examples of the ages in which rock to made. The cutatog Alta fratures all kinds of rook for muchinuts, and professional and amageur me-

400 pages of fine tools FREE

Select your tools from this catalog - then buy

them from your hardware dealer, mill supply or automotive supply dealer

HIS 400-page catalog is used by carpen-L ters, mechanics, and machinists—who select from its pages the tools they need—and buy them through their local hardware or mill supply man.

You, too, will find this a pleasant and easy way to buy tools. A three-page index helps you find what you want—at once. Clear, easily understood descriptions and good pictures leave nothing for you to guess at

Whether you make your living with tools or For the catalog, address

use them to follow a hobby, you need this booklet, with its 400 pages of pictures and information.

Goodell-Pratt Tools will serve you well for years. No finer tools are made than those that bear the name of Goodell-Pratt.

Select your needs from this catalog; then buy them from your nearest dealer. If he doesn't carry the Goodell-Pratt line, write us for the name of a dealer who can supply you.

GOODELL-PRATT COMPANY, GREENFIELD, MASS., U. S. A.

MAKERS OF Toolsmithe MR. PUNCH

GOODELL-PRATT

1500 GOOD TOOLS



First Aid For Builders of Ship Models

Ancient and Modern

Plans — Scale Blueprints of historic and modern vessels, racing sais yachts and power boats

Lumber - Selected white pine for hulls, strught grained sprace for spars, three ply veneers for decks, mahogany, etc.

vencers for decks, mahogany, etc.

Tools - Specially designed - Chisel - Gouges and Planes to fit exactly modelmakers' needs

Halls - Made to Scale of selected white pine

Halls - Made to Scale of selected white pine in the rough partly finished or completely incohed

Boat Fittings Blocks, Dead Eyes, Turobuckles, Ciears, Chocks, Davits Airports Capstans, Bionacles, Rigging Line, Sail Lucch etc.

Ododel Sailing Boats - Complete ready to

Model Power Boats - Complete ready to run or construction sets

Construction Sets to different stages of completion, spring motors

Steem Boilers-Made of seamless tubing, boiler fittings, blow torches

The bookiet has many pages of information me all to modelmakers, model yechtsmen and others on saving Model Yachts

Brief history of Steam Engines

II. astration of famous models made by the House of BOUCHER

Nautical terms in common use

Parts of a sailing venel—spars, rigging anota, hatches and spinces commonly used on boats

Hints for painting and finishing Model Boars. Wherever type of ship—sail of steam-nation or modern—you are building or pranting to build, you will find the booklet "Scale Models" of tremendous bein to you. Send 250 today for your copy is will be sent to you by return mail.

Headquarters for Model Makers for 22 Years

Boucher Inc

415 Madimo Ave.,

New York

Entered in typ, for which please word the most brought.

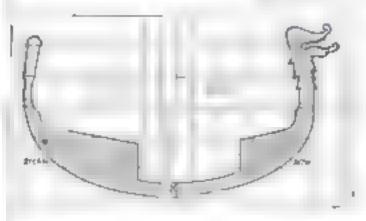
"Some Mode-"

Non

Allenn

A Ship Model All Can Build

(Lantenuol from page 21,



To simplify the construction, the first, stem and stempest are in our pieve of 1, m. thick plywood

through the corner to these lines at several places. With a closel clap out the waste would to these saw cuts; then with a gauge or closel cut away the rest until the blocks are about \$\frac{1}{2}\$, in thick, with square code, as shown. If the bow and stern decks are to be built up, these square ends also will be cut away, as mentioned before, and the whole of the built pieces will be of the one thickness.

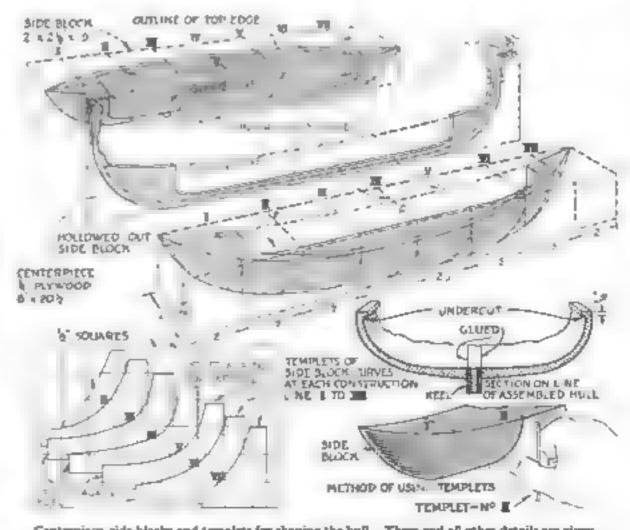
These two pieces now should be glasd on to the centerpiece, being careful that they are evenly placed and that the bow end of them is toward the bow end of the centerpiece. Leave these three pieces clamped or wedged together for twenty four hours to aslow the glass to set thoroughly

Hold the model up directly in line with the source of your light and see if you can detect any inequalities between one side and the other, or bumps or bollows. There should not be any but if there are, spootle them out, because a symmetrical whole is more important than exact adherence to the lines given.

If you are able to make a neat yob of it, the edges of the planks should be shown on the outside. The Gokstad ship had about flurteen planks to a side, but the Oseberg had only mue, and that will be as many as will look well on our model. Therefore, divide the side of the hull anodships into nine even spaces. Draw lines with a soft penell along the hull so that the lines gradually draw together and earl up a bit to the ends, hold the model up to the light and look

along the lines to see that they flow evenly. With a sharp kinfe cut into the hull at these lines about 25 in, deep. Then, with a small closel held almost flat on the hull, cut up to these lines, thus forming right-angled grooves with their edges down, going the appearance of placks, as with an orderary clucher-bailt row mat. How to do this is illustrated on page 71. This is not so difficult, but if you cannot do it neatly it is better not to do it at all.

Now proceed to googe out the ball considerably thinner. But another pencil line round the top edge a full by in, from the edge and work gradually down from this to the bottom, where the inside of the boll should be level with the top of the centerpiece, here more properly called the keelson. Shave at this as you safely can, but be very exceful not to cut through. Holding the tail up to a bright light and watching for any transparency will give you (Continued as page 80).



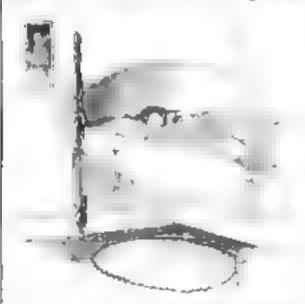
Conterpiece, side blocks and templets for shaping the bull. These and all other details are given full may as Pursuant Screece Mosteray Blueprints Nos. 61 and 62, which are listed on page 92.

Making a Big Bed Safe for Children's Use

By Frank I. Solar

YOU may never have heard of a bed rail "saddie," but you have heard of the little folks falling out of hed. And bed rail saddles are intended to prevent just that. They are added to a big bed whenever it is to be used by small children and are stored away when not in use

Any wood you have at hand will serve for the saddles as they are to be painted some height color. Plane the surfaces, cut the ends square and hold the piece along aide the bed rail, if it is not perfectly



One or two bed rail "enddles" are added when children are to sleep in a large bed

straight, so that you can trace the pattern to be cut on the bottom edge. Also by out the corver on upper edge and one end

With a larining or coping saw cut care fully to the bacs. Smooth the edges with a wood rasp or coarse sandpaper and finwith fine undpreper The pulper should be wrapped over a cound or oval stick, so it will fit the irregular curves.

The cleate are faste and with screws at stove borts. If the latter are used, file the ends so the bed clothing will not catch on them. If your suidle is not as thick as the bed rail fill out between the cleat and auddle with cardboard.

A Ship Model All Can Build

(f onlineed from page 831)

sufficient warming of dangerous thinness. At about 16 in, from the top edge there should be a sharp cut-under of about equal depth, and from there an even curve to the keelson. Sandpaper the sup reasonably amouth inside.

That completes the main part of the boll of our fact slong serpent. It is, in fact, very

similar to the slip m which another laef, the son of Enc the Red discovered America.

Next month we shall put on the gunwales and interror littings. Already however. our model is interesting and good to look at.



A few saw cuts make it easy to hollow out the two side blocks

How Thick Is A Page Of POPULAR SCIENCE MONTHLY?



The thickness of a page of this magazine—.0027 of an inch is several times as great as the variation frequently allowed in machine tool work,

For making measurements twice, four and frequently ten times as fine as this, mechanics the world over rely on Brown & Sharpe precision tools.

These tools are used in both commercial manufacturing and the finest of tool work. They are used every day in making fine measurements in mechanical industries where accuracy is a paramount point.

> It pays to look for the Brown & Sharpe trade mark when selecting precision tools. For it represents performance recognized everywhere as the world's standard of SCCUPACY.

Hardware dealers can supply you -or write for Catalog No. 30.

> Brown & Sharpe Mfg. Co. Providence, R. L., U. S. A.

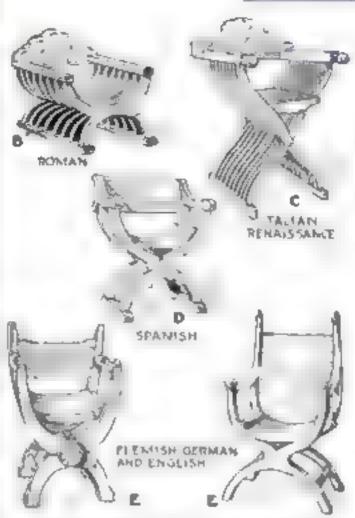


"World's Standard of Accuracy"

ALWAYS ask for PEXTO Too s and have the as surance that you are getting tools that are especially designed to do properly the work for which they are intended The Pexto line consists of Braces, Bits, Chisels, Hammers, Hatchets, Phers. Pruning Shears, Screw Drivers, Snips, Squares, Wrenches and many other small tools Ask your dealer to show **VOU PEXTO TOOLS** Write Us for Hooklet The Peck, Stow & Wilcox Company Southington, Conn., U. S. A. No. 45 Adjustable Angle Wrench Sires 4" to 18" Forged Steel

You Can Build This Armchair

(f outsumed from page 2d).



Five typical designs for even legged semchairs. The Spanish type 'D) is especially popular at the present time. The curving often is most claborate

peripits a degree of flexibility. The broad leather seat and rather high back of leather adapt themselves to body persaure, so we have a very comfortable chair.

In this sketch (G, page 21) we have a semifolding clusic; it has a sort of rule joint for the center which permits the arms to be brought ingether and the chair to be folded so it may occupy a smaller space. The seat is of heavy leather, while the back is made from a piece of cotton belting or webbing covered with leather. The flexibility thus gained permits greater adaptation to the position of the body and as it has a water seat and back than the

others, it is a wonderfully comfortable chair

of these chairs?" asked Val.

"Why don't we see more of

7 ELL, there are various reasons. The very fact that they are not being purchased by the rank and file of furniture buyers means that few are manufactured. nence methods of mass production cannot be economically applied. Of course, that makes the price higher than for other charts of more usual forms. The more elaborate and heavier chairs (C, D and E) are suttable for club and lodge rooms, antercoms and libraries, rather than for homes, where they seldom have the setting or virta to do them justice. Besides this, the legs must be sawed from a plank so the grain will give the greatest strength possable to each leg. Thus causes such

a waste of light grade lumber that the chair is not favored by designers and manufacturers of commercial furniture, but a chair is a lexity. unless, of course, you make one yourself, and get a seventy five dollar chair for perhaps fifteen dollars or less in materials."

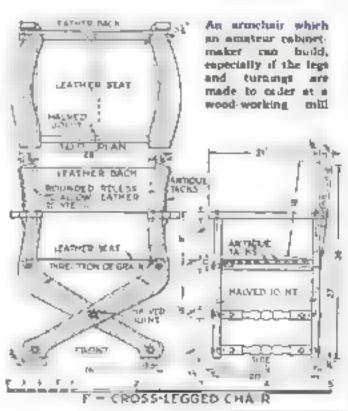
VIL had been examining curefully one of the dimensioned drawings (G) in the sketchbook, Now he said enthusandically

"I be a ve I will make one of these chairs this winter for my 'eveningsat-home' job. It will be fine in the hall beside the fireplace if finished in dark out and upholstered with Spacesh leather. How can I get part the right curve to the arms and legafrom this sketch? I think I shall have them sawed at the mill, for I would find more hard work than pressure if I tried to saw them from oak plank with a handsow "

You are right there, answered Jimme, "and it is a simple matter to transfer and emurge the curves. Make a sketch to a sense of say, one and one last melos equals twelve recles and his out squares like

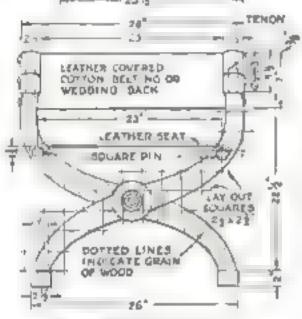
Jumpse took a pencil from lispocket and sketched rapidly, while Valwatched lum.

"These legs," explained Jimme, "then may be enlarged to nev size, and the curves accurately reproduced by drawing larger squares upon stiff cardboard. In this case they would be two and one fulf by two and one half mehrs. Draw the corves through them in the same relation as in the small sketch. Then cut the pasteboard to the lines and you have a pattern that may be used in marking the legs upon the plank preparatory to band sawing. The arm, and in fact any curved (Continued on page fit, line may be



You Can Build This Chair

(f antioned from page 60) HALVED



G . SEMI-FOLD NG CHAIR

Working drawings of a fine type of crosslegged chair. Compare with D, page 99

enlarged in exactly the same manner" "I understand perfectly," said Val. "I will work this out with a great deal of care and will have a lot of fun minking the chair this was er. I think nothing else in the construction will give me much trouble. Aryway, I shall see you frequently and if I get in a tight place perhaps you will keep me out."

"Gladly, promised Jimmie.

Straightening a Saw



By the utilful use of nail set and hummer it in often possible to remove asw limbs

FRIENDLY carpenter recently showed me how he removes a "kink" in a handsow blade. He laid the blade flat on a hardwood block with the bulge of the kink upward. Then, with a nad act or drift and a hammer, he worked along the blade, as indicated by the dotted line, and hammered it flat. The weight of the blows was heaviest where the bend was highest. F. H. T.



When Lieutenant Walter Hinton made his flight up the valley of the Amazon seeking the source of the Parima Watershed, he had to stay in the air. For below stretched an inpenetrable forest where a landing meant certain

All tools but one had been stripped from the plane in order to save gasoline. That one was a NICHOLSON File Lieutenant Hinton says:

"We cut our NICHOLSON File in half for the weight saved represented a pint of gasoline. But half a NICHOLSON File was for more useful to us than any other tool would have been. It could do a score of repair jobs in the air."

This striking proof of the usefulness of NICHOLSON Files is equalled only by their convincing record doing everyday jobs in industry and the home.

Lieutenant Hinton carried a 6" Flat Bastard File. Your hardware dealer can show you a duplicate - also the rest of the NICHOLSON line.



Previdence, R. I., U. S. A.

-A File for Every Purpose



Hammer like a Maydole

The experienced carpenter or mechanic will tell you that the Maydole is the finest that human skill, press-forged tool steel and clear, secondgrowth, air-dried hickory can produce. The Maydole Hammer has been the choice of the craftsman since 1843.

Your dealer sells the genuine Maydole. Ask him to show you one in the style and size you prefer. Heft It! Swing it! Feel that marvelous Maydole "hang." And remember that when you buy a Maydole you're getting all the strength and durability that can be packed into a ham-It's really the most economical hammer you can buy.

Send for free Pocket Handbook 23 "B"

Give us your name and ad. dress and we'll mail you a copy. It's chock full of interesting and valuable informstion. Write today!



What My Shop Taught Me

If outsured from page 7 ...

power, and this does away with the other grander, as I can use the wheel attached to the lathe with much better results.

Perhaps the old grandstone, with its fromen of water, as used by our fore-

fathers was the belter was of growting Iools lat it is too slow for this swift tig age and morlers emery and earlierundatu wheels make a faster job of it. But we must look out test we spool the tools by pressing them too and long against the whisel and overheating Dinne

A few of the things I buve made are diustrated. The

cedar chest was built entirely by hand from rough cedar purchased in the form

of I-m, planks.

Of the other things I have made—and enjoyed the making-may be mentioned three winter tops for three different ears, a Colomal mahogany desk, a Martha Washington sewing cabinet, a prano lamp, a radio set and calonet a corner

exhanct for the breakfast room, an unilarda stand, medicine chest, all our letchen farn ture, including a porce ain top table, and one commercial job- a dental calquet. This last piece was con-

> structed of nolid manogary white enumeled made with porcelain shelves, glass cours and a long beyones merror running the fall lengtl. To make so elasorate n piece was no easy task

> I am looking for ward engerly to the time my little dangeder is six years. only for then I prant to make a complete testroom set for her with a bareau, hed.

chest of drawers, chairs, and a desk, all r miniature size, painted French gray and decorated in blue. I shall also see that she gets a doll's house.

So, in summing up. I may say that my little workshop means everything to me It gives me just what I need—a rest in change when I get home after a hard REMARK WOLK



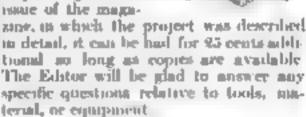
A desk of Mr. Strand's own design, which he constructed of mahogany throughout

Complete List of Home Workshop Blueprints

NOL ?

end 11

AY ONE of the A thegrints asted orlow can be obtained for 23 centa. The black prosts are complete. in Dienselves, but if you wish the corresponding back issue of the magn-



POCULAR SCIENCE MONTHLY 250 Fourth Avenue New York

GENTLEMEN

Send me the Mosprint, or Muspeints, have underlined beion, for which I in-

1 Bewing Table Feb., 22 2 2 Smoking Cabinet Mer., 22 2 3 End Table Apr 22 2 5 R tehen Cabinet May, 22 2 8 Shaving Cabinet July, 27 2 9 Arbor Gate and Seath July 27 2 10 Porch Swing Aug, 22 2 11 Berch and Till Table Sept., 22 2 12 Electric Wesher Oct 27 2 13 Tea Wagen Nov 21 2 14 Clepathiat Torn Der 21 2 15 Winfisher Berirh Jen., 23 2 16 Iound Radeo Cabinet Feb. 21 17 Cedar Chert Mar 23 18 Phone Table and Stool Mar 21 19 Grandfather e Clock Apr., 23 2	Glosse	CGU/2			
9. Arbor Gute and Seath July 27 7 10. Porch Swing Aug. 22 2 11. Bench and Tilt Table Sept. 22 2 12. Electric Washer Oct 27 2 13. Tea Wagen Nov 21 2: 14. Christmat Turn Der 21 2: 15. Wurlahop Bench Jon., 23 2. 16. I found Radio Cabinet Feb. 21 2: 17. Cedar Chert Mar 23 2: 18. Phone Table and Stool Mar 21 2: 19. Grandfathe: + Clock Apr., 23 2:	Au.	Title			Price
An emeroprocess spring an ar	9. Art 10. Por 11. Bert 12. Etc 13. Chi 15. Wu 15. Wu 17. Ce 10. Pix 19. Gra	or Gute and Seath orh Swing orh and Till Table orthe Wesher i Wagen rights Toyo rights Bench ond Rades Cabinet las Chest one Table and Stool	Mer., Apr May. Juby. Juby. Aug. Sept., Oct Nov Der JyB., Feb. Mur Mar	22 22 22 22 22 22 22 23 23 23 23 23 23 2	25c 25c 25c 25c 25c 25c 25c 25c 25c 25c

diene chart Page Colonial Deak
Cabaset and Deak
Pergula Garaga
Gateleg Table
Cance Su my Garat
Raby's Crib and Pen
K shen Cabaset Table
Pullman Play Table
Toy Tee Cart, etc.
Tool Cabaset
Formula Cabaset
Revise Cabaset Colonial Desk April Apr. 25c June, 250 Sept., Nov. J=n., Sewing Cabineta Chinese Game Table 2444445555555555 Mar, Dining Alcore
Gurden Treimen Apr 35. Sumple Radio Cabinet Rush Bortom Chair Chi Nov., Sheraton Table Salem Chesi Déc Jun... Prb., Drak in Shereton Style Mar. One Tube Rudio Bet May, luly Peh. Three-Stage Amplifier First Tube Receiver Pirate Ship Model Hull 25c 25c 25c First Ship Bottell
First Ship Details
Gaticon Model Hull
Gaticon Model Mull
Gaticon Model Model
Broom Cabinet
Auplane Model Fifthap
Clipper Ship Model Petails
Chapter Model Betails
Chapter Model Bissing Mac May June. 25¢ յաջ, Aug., Beplay 33. Choper Model Rigging PHOY ... '28 Five Tube Radio Set Ort. 25t Ort.. 55. Bird and Ammai Toys 57 Constitution Model: Hull Dec , 26 len... 137 23c 27 Mr. Constitution Raging 25c Constitution-Rigging 25c Feb., 60. Welsh Dresser Mar 37 73c 61 V king Ship Model-Hall 27 Apr 25 c 52 Viking Ship Details Apr.

(Please print name and address very clearly,

City and State

Bird House Is Small Copy of Its Owner's Home

TF YOU enjoy model making, why not I hand a nied house that is a miniature of your own home? That is what we did. Our bird house, as the illustration shows,

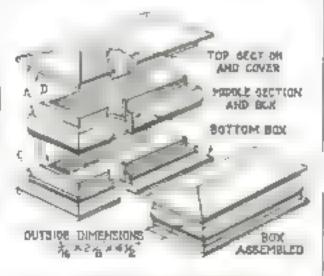


is an exact model of our own house. It loss a door set in and carved exactly as in the big bouse and, of course, it is painted the same color. The annuature window boxes serve as perches. Common H. Skane.

Mystlfying Stamp Box Has Secret Compartment

YSUALLY one not in the secret wall pick up the top of this box and find merely an assortment of man, paper clima. robber sands and pen points. The knowng one, lewever, who grasp the middle section and lift both t and the top, thus revening the secret stamp compartment in the bottom box.

In making the box cut out the top to by \$14 by \$55 in, and shape it as shown. and make the bottom, which is only by m.



How the box is comtructed. The bottom compartment is the one used for concealing stamps

thick. Then unter and glue together the 16 by 16 to, strips which form the pin tray or middle section—it is 1 1/2 by 3 1/4 in. maide measurement—and glue the 14 in. thick bottom in place. Around the outside of this tray glue the strip A, which is 45 by 34 in. Then give strip B. 34 by by m, and strip C, by by bu in, to the boltom. Glasstrip D, which is similar to C. to the top. If cutting and assembling are done accurately, the box will close tightly, yet open easily.-C. A. K.



For that clean-cut look of success

try this invigorating massage after shaving

C UCCESSFUL men look the part. They are clean shaven, clean cut, and well groomed. They have that glowing look of health and vitality.

A muddy, half clean, blackheaddotted skin can never be a partner of the successful man. Yet you can have the clean look of success. It takes no extra time. It can be acquired easily and pleasantly in your own home

After you shave, use Pompeian Massage Cream. You usually use something aftershaving-hot towel, lotton or cream-to remove the dirt and clinging soap particles that become imbedded in the skin. Water, lotions, soaps-all reach the surface only. They do not remove imbedded dirt and secretions. Pompeian Massage Cream does.

Use this pleasant, gentle cream after shaving. See how your skin takes on the glow of life and action. See how imbedded dirt, even blackheads, rolls out under the mild but efficient urge of this quickly applied massage. You will like its restful, zestful "feel." Above all, you will like it for the feeling it gives you that-by gosh! you really are clean.

Make this coveraging hand ten free Wash you, hands the remaining Ruba rate Pompe an Massage Create into the back of your hand until the cream here this appears. then comed out upon N this the cream que co pro-



is dire that you could not remove by washing You can make this simple but con-vencing cert court Get a just of Pompesan Manage Cream in any drag store for harverent if you prefer to make the test before you buy, merely mail the coupon below.

OMPEIAN MASSAGE CREAM

Increases Your Face Value

FREE - TO MEN ONLY

The Fumperan Company Dept. 34, Cleveland Ohm Please and me free, the sample rube of Fumperan Manage Cream with enough cream to make the hand test and to give me several gitterining sell.

Name	
Scare	
Gir	5mm



your hardware dear Thill win a co E De ATKINS"SilverSteer Saw ready for a lifetime of better service in your home. It not only duts easier and faster but outwears many "cheap" saws. Look for the ATKINS name on the blade—save time, money and labor

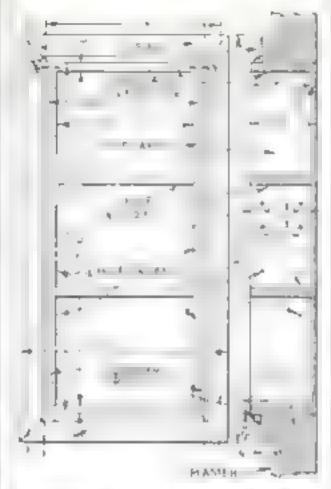
hope to a ATA NASAL . CC C

E. C. ATKINS & CO Established 85

4 92 104

@ INDIANA TOLIS C S.A.

A Built-in Bookcase



4 · v Puntage so which we sale not the west to

Description to the large large and and reference for the same of the project gends of the social els-

He save to tom read to get I Chanse the best or as the the sex his trangitte plear go his who a hander or a tenougapteer the case in to be chart If you I do it is milital examination of the poor jar -- n () r n n head per -

C. Coulding you are between the son with a top and helitory marager for the has get processored a personal the gen-I seas condition for the place place and a condition of the place and th next the lattle with a continuous saw. Three fully en professor, key of above a sole the lides or the other side of the parthou and suprice assert to prace

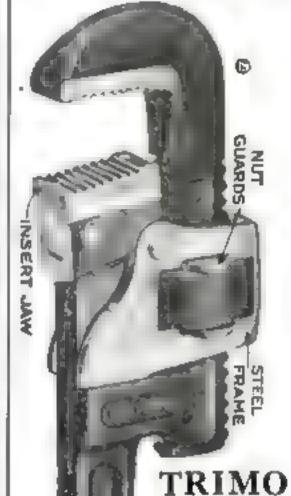
PLI MB accorately, wedging the same with shire costs or our the a well as the englishment of the a few a the side after the sections.

User the reagh tilges of the plaster with a posse of the fire past users t provided the less. Round off the cartie edges below fitting Mariner 21 a carter pour la aughed after the applying and secretary above in an indicate technique. becase, and believed a high acresident be accurated made although the in ters at the corners whom, by weltweet. Finally, period of the corners of the best to a racers of by m.

Standard varish or enamed be made to the transfer the book as to hald the transfer to the tran of an one

Note of Blocks and property and be against a stipping or most regions color lightly occurs from as buff or histplon acra send group tof gray. The fire color must be they and years before the and a fast

For Every Tool Chest or Bench



Pipe Wrench Distinguished in Its

lendership by special features that appeal to every man who appreciates Aned DOM:

enklit JAWS Re-praceable when worn with hard service at n fraction of the ring of a new wrench. NOT ULARDA Keeps the TRINO adjusted

the TRIMO adjusted perfectly in close quarters of when bad down TRETE THAT GRIP—But will not lock, but they can be referred readily PRESSED STEEL FRAME—WID not break therefore.
TRIMO is stronger

TRIMO is stronger and safer than most

Wrette hes Right Steel Handle sizes 4 to 48 Four Wood Handle Sires 6 . 8", 10 and 14"

Monkey Wrench

to made machanically correct. The levelage incorrect. The leverage in-creases in proportion to the increased size of the nut or object to which is a spained. The drup forged morable , subject lend outward instead of lowards the handle to ad ust Serve prandard sizes—h pp 21 inches, metasive.

TRIMONT MANUFACTURING CO. Rosbury Boston Mass.

tunersea'r flendeng Weench Makura For Acardy. Factor's care

A Quick and Simple Way to Construct Window Screens

By A. J. PHELPS

WHEN making window screens. I follaw a method that is the height of sompliesty. It allows no chance for errors. in measurement and, therefore, the seree is are bound to go in place without

any fit mg and placing

The two side pieces or stiles, which are If by 1 & m. stock, are cut to suit the window frame, and the hottom rods are bevoled to fit the slant of the sill. Then these parts are laid fint on the sib and the rester and top rais are marked for length, that s, the distance across the window less the combined width of the side pieces. The bottom run is the same length, but is \$12 in wide. It also is bevelod along. one edge to scal the sail.

The stres then are marked for the center rul at the beight of the check



The etrop of wood lying on the sill is a cross rail which is being marked (or length

meeting) rails of the window and the parts are nailed together.

Wir-low serecting is obtained of a wellth to inprover the frame 25 in. on each side for tacking. A piece 1 styllouger than the opening in cut off. The way I do this is to shit about 2 in of one edge, grasp the shit with one hand and then draw a kinfe. between the weave.

In tacking the wire. I first fasten one side and end. A piece of \$4 in thick wood. is then placed by in away from the rematuring stile on the under side of the sereet. The fingers are placed on the screen over this strip and the thumb is pressed on the edge of the state. This gives all the tension needed waste tacking the remaining side and end of the wire.

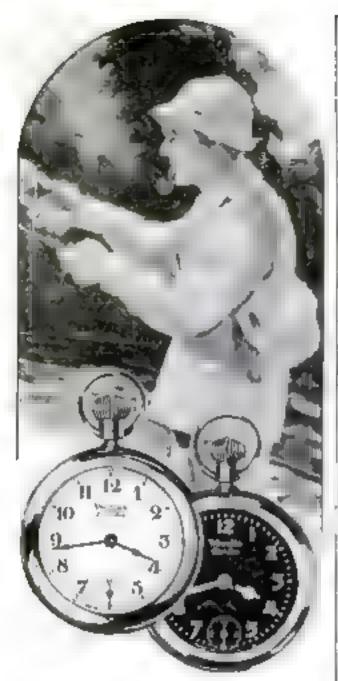
A 2-in screen head is cut into pieces 1.6 in longer and wider than the opening and qualed on, except toward the corners. which are left loose. A miter is sawed at each corner through both pieces of the bead, and the nathing is completed. A head is bradued to the center rail and them the screen is ready for hardware

Thes makes a light screen, but my expemence has been that it is strong enough.



I day....

Cleary, Illinois



Outdoor men like Pocket Ben

HERE'S a steady, faith-ful, out-of-doors compamon-a friendly little pal to take along when you're roughing it.

You can rely on Pocket Ben to measure the hours and minutes faithfully. He knows when it's starting time, meal-time, bed-time no guess-work about it.

Pocket Ben is Big Ben's brother. The family name "Westclox" on his dial is your assurance of everything true and faithful in a time-keeper,

Sold everywhere—\$1 to. With luminous night-dial \$2.25.

WESTERN CLOCK COMPANY La Salle, Illinois

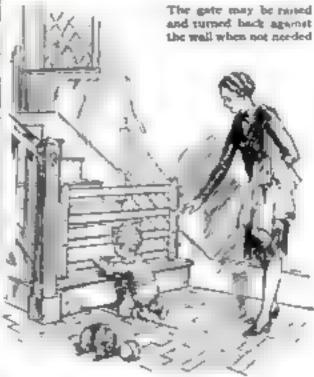
The SHIPSHAPE HOME

Gate for Stairway

TO KEEP the baby from chinlang up the stairs. I made wooden gate

that rould be adjusted to the rise or angle of the stairway and swiing back against the wall entirely out of the way.

The crosspaces of 36 by 134-in. strips were placed between two 1/4-m. thick up-

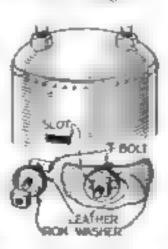


eights at either end and fastened with a I win, screw in the center of each joint Four small serew ever with a rod run through them were arranged to serve as a hinge. The other side of the gate to lowered into a sort of slot when the gate is closed. - Roy W. Marson.

Patching a Water Tank SHOULD there he a bein in an other wise good hot water tank the meth-

od illustrated may be used to repair it easily. The hole is drilled larger, if

necessary, and given a reclangular shape with a Then the head of a common machine bolt is fixed flat, shipped through the slot, and given a quarter turn. Aleaster. washer is slipped on the holt, followed by a steel washer and a pat. which is acrewed up tight.—J. H.S.



A Wrother Labble regarder

Windows in a Partition

THE handy man sometimes has the task of inserting a small window in

an interior partition, which involves quite a bit of work if a neat job is to be

Recently I had to put two such windows in a newly erected wooden partition. in order to allow more light to reach the rellar stairs. I coking around for material. I found two discarded picture frames of about the right size. After culting openings in the partition to take the frames. I removed the grass from them and fastened them in place with nails. A small monthing was added to conceal the joints. Ther the glass was replaced and heid with light strips of wood.

Another way to have utilized the frames. would have been to cut the openings in the partition to agree with the made measurements of the frames and had them flat against the wall. Either recthod insures next looking windows at little or no cost. - W. L. L.

Removing Rust

A SEMPLE and of feetive way to remove rust from small and delicate

objects is by electrolysis. Obtain a large bows, connel or glassware. Fill this with enough water to cover the object to be treated. Attach about two feet of iron were to a block of mue, and to the other end of the wire attach the object from which the rist is to be removed. Make sure that good electrical contacts are secured in each case. Lininerse both from

and zine in the water, but allow The iron wire to ирреаг вроус the surface of the water. Now add about ten percent of oilphune acid to the water, the exact proportion is unumper-

ENAMELED RON TO M

WATER-90 PERCENT

SULPHURIC ACID - 10

FT OF IRON WITE

Hydrogen gas will be given off

An electrolytic process

from the rose with vigorous bubbling, whole smaller quantities of gas will appear. rising from the from object. The process asually will take two or three hours longer if the rusting piderp. Gentle brushing with a steel wire brush wil, help.

When the rust has all gone, rinse thoroughly under sunbing water, and dry quickly Petrolatum, od, celluloid variesh or sometaing similar should their be applied to prevent the reappearance of the rust. DOUGLAS LEECHMAS.

Redeeming o Garage

Last year I built a one-car garage, with a wood moing finish and a

peaked shingled roof. In the back wall of the garage, high under the peak, I placed a single window of the cellar such type, for ventilation and light. As a ventilator it was ideally located, but from the exterior it made the garage look entremely high and unattractive,

I solved the difficulty by building an 8 ft trellis, about 2 4 ft wide, consisting of four uprights and horizontal members spaced so as to divide the open spaces. roughly into squares. Just above the center I cut out (Continued on page 97.

132 E

The Shipshape Home

(Continued from page 64),

the inner two upright members and

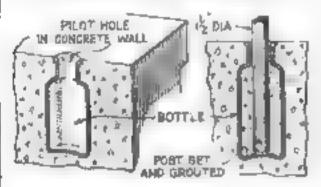
placed a flat diamond shape.

Now the eye no longer travels upward to the window as the only detail breaking the flat wall space, but centers pleasingly on the diamond shape in the trellis. And somehow the roof seems closer to the ground, and the wall seems just part of the picture, instead of thrusting itself to unpleasant heights. A rambler rose completes the picture. - J F HARDECKER

Pilot Holes for Posts

When erecting guardresis for fences where pipe fittings are to be

used and the posts are to be set in a concrete wall or floor, a rigid and workmanlika job may be made by placing widemouthed quart bottles in the cement to



Large bottles placed in concrete walls or finors to serve as prior holes for fron guardrail posts

form paint holes. When the concrete has hardened, the posts are set in the bottlesand grouted with cement.

Bottes usually may be obtained that will receive I spin pipe: if larger pipe is used, some of the concrete and glass around the top will have to be broken away.-J. A. MILLER.

Preserving Brushes

WHEN through painting, one is apt to put the timuli away care-

fully in turpentage linseed oil, keroscor. "thurser" only to find, when it is necessary to use the brush again, that the liquid has evaporated and the brush is as hard as a rock.

Here is the missing step in preserving

brushes: Take a piece of abeet rubber—it may be a piece of discarded awimming cap. a toy balloon, or an old maer tube. Pierce a small hale for the brush handle. Tie it tightly over the top of a glass jar or can as shown in the illustration. The preserving liquid will not evaporate so quickly and when you go back to use your brush, at well be soft and pliable.—J. L. Jokes.



brush jar or ran

BEFORE cutting a large sheet of common window glass, look along the edges to see which face of the glass is convex. This side aboutd be turned down on the table.



-with these two famous Indian pals

Alt set, fellows? Here's how! For health-A ful outdoor sport - for comfortable travel at less than carfare - for getting quickly to business or pleasure - an Induan's your best "pal" every time!

Try either model, the Prince of the Scout. Smooth, quiet, powerful - safe! Easily handled and as dependable as your best friend. Takes you anywhere, anytime, at a fraction of carfare cost—only a centa mile or less. Team up with an Indian—now and know the real meaning of motoring joyl

Easy to Own

Call on your nearest Indian dealer. Let him demonstrate the Indian Prince and the Indian Scout—the two "pals" that cut the heart out of travel cost. Let him tell you about the easy pay-as-you-ride plan that enables anyone to own an Indian. The coupon below brings you—free—our illustrated catalog. Mail it today for the complete interesting story of these two famous models.

DEALERS!

A few good territories still open. Real opporturery for ambitious men. Write now | _

Indian Motocycle Co.

Dept H.4 SPRINGFIELD MASS.

Check nervest age at help as ruggest the matel for your requirements

THE INDIAN PRINCE The Solo Single

Learn to ride in a minutes. Clarks steepeer kill in high. Speeds to 10 miles are beautiful and the second transmission. Two-start effected over the Light is away 90 miles per gallon. Less than 1, one mile operation to a richer that equipment four P. O. R. Spenggleid. Mane.

INDIAN SCOUT The Solu Twin

Two celinder amonthness, twice testate mend in wer im-buried with again might may easilite ease. Anothing of miles put miles. It per mile highest meed-value. These tands delivered 7 years again in one today. Petro with complete electrical equipfield. Man-

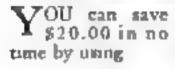
Motor the Indian Way

Lowest Initial cost! Lowest upkeepl No garage bullel No traffic delays

ladim Monierele Co., Mari
Deple Plot of Catalog Catalog
Send me your and the Scout on interested in
Send me your illustrate to be interested in the Prive and the Stout. One k has square if you are interested in our money making proposition to dealers.
Out Monty Making Par
Neme and the second of the second of
Address
SIN TO TO OVER IN LA
Apr 12 to 16 - 16 to 20

IF YOU CAN USE AN EXTRA \$20 99 BILL

write for this FREE BOOK





SMOOTH-ON No. 1

to do your own household repairing-and in addition you will have that proud "I-did-itmyself" feeling

Here is what one enthusiast did with two 15 cent cans:-A \$25 lamp stand loose is base, two big leaks in heating furnace smoke pipe, loose hammer handle, and three liese hooks in tiled bath room wall were all put into good unable condition at an average cost of 10 cts. for each repair—and \$20.00 easily saved over what would have been paid to professional fixers or for new parts

By using Smooth-On to make dozens of the simple repairs necessary in every home, you can save enough to pay your radio upkeep. buy yourself or your wife a camera, a buly papup some other pleasure giving article than your would atherwise have to spend the money for

On the Automobile

Smooth-On No 1, being unaffected by water, isl, gasoline or heat, is also excellent for automobile repairs. Try it for stopping radiator, rank, pipe line and hose connection leaks from the outside, keeping exhaust line connections tight to prevent the escape of obnoxious burnt gases, repairing cracked water ackets and crank, goar and differential cases keeping greater cups, lubricator connections. note and hub caps from loosening and fa hing off, tightening loose hinges, robe rails, etc.

The FREE Smooth-On Repair Book

will show you how an automitting number of home and automobile repairs are as easy for you to make as for somebody slic-

Mail the toupon for a free copy and get Smooth-On No. 1 in 7-oz, or 1 or 5-lb can run any kardware store



BMOOTH-ON MFG. CO , Dept 58 574 Communipaw Ave., Jersey City N. J.

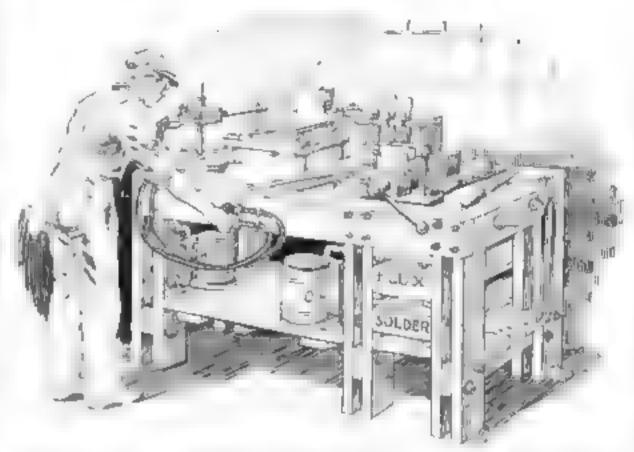
Please sean the free Smooth-On Repair Book

Address

Return this coupon for a FREE copy of Booklet

Bench for Small Soldering and Hardening Jobs

By HENRY S. LARABY



The brack contains a stand for the blowtorch is furbace, a pilot gas flame, swinging oil and water tunius, deamers for holding soldering supplies, a file facts, a holder for tongs, and other equipment.

ED MAN WILSON was so also sorbed in watching the flame in he new "hearth" that he did not notice the standow cast by a visitor.

What in the world is this you have: his vistor asked

Whon although somewhat startled kept as rand on the gas control to the torch as he looked around. He granted in recognizing his friend

This sans new toy he said with the same pr. Ie he world have shown in morefroming a new car

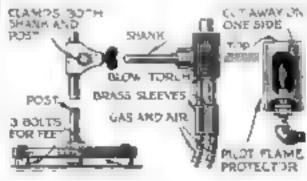
Well, it looks as if all the playthings

are right at band'

"Certainly! That is what I wanted We have needed something like this for a long time, so finally I got the lumber and had one of the apprentices build the bruch in odd times. We had most of the enumment about the place. How do you

"beens convenient for such work as lempering and soldering.

You are a good guesser," Wilson rebirned. 'We call it the 'blow torch beach,' but it is really a bardening and soldering outfit. See, we put it where



Details of standard and clamp for supporting the blowtorch, construction of the pilot burner there is good light, gave it a sheet from top, and built a little furnace at the correct height to save atooping. Oil and water are in buckets arranged to awing out of the way, so they won't be kicked, and there are drawers for solder and flux, and the like.

"The gas torch is mounted on a stand so that we can adjust it to heat anything we can put in the furnace, or we can use the torch to heat work held in the vise. The furnace has a hole in the top for not dering issue, and the fumes go out the same hole instead of blowing back to your face. There is a pilot flame going all the tune so it takes no time to light the torch.

"I have been wondering if some such areangement would not fit in well in my basement at home?

"bure thing," Wilson replied, "The whole thing is made of two by sixes put together with bolts and lag acrews. You would not have compressed air as we have. but you could get a saturfactory bupsen burner for small work. A combination bke this would be fine for any sort of shop, large or small."

"It certainly looks good," the visitor ngreed.

Drilling Very Hard Steel

*O DRILL a piece of very hard steel, even when tempered, try the following if other methods have failed: Take a carbon steel drdl, grand as required, heat to a bright red, dip in powdered roans about five seconds, and then plunge into n water bath. Use turpentine for a coolant. I have found that this will do the work four times out of five. H J C.

Old Bill says

ENGINEERS and machine designers often can save money for their firms by getting acquainted with the shop force.

The man in the shop is in a position to see where time or materials may be saved, sometimes by a trifling change in the design of a part.

Lathe spindles have a poculiar tendency to wear out of round because of the pressure of the cutting tool on one usdo; this is noticeable when a hole that has been bored to close measurement is found to be out of round and tapered.

A worn fathe spindle usually will bore holes that are tapered with the front end large.

Poor work may result also from the wearing of the carriage ways.

Never pass by any evidence of danger or accident without correcting or reporting it; your own life and the lives of others may be at stake.

A good machinist is always a careful. workman.

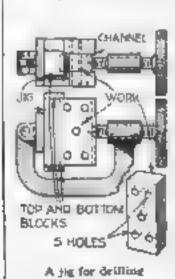
Automatic lathes have taken a lot of work away from the engine lathe, but after all the engine lethe is the most economical all-around machine for general work.

Equipped with a few inexpensive accessories, a lathe sometimes can compete as a production machine with high priced special machines that are of no use for other work

A gage should never be forced to ubtain a fit.

Do every job as quickly as you can, but don't forget quality in your eagerness to pass on to the next job.

Oulck-Acting Hinged Jig



MR drilling P five holes in the small block, a hanged drill Jig was devised as illusleated. The work fits in a channel section that is provided with guide holes and is clamped with tac knucled screw The jig is swung open for cleaning and loading. — FRANK N COARLEY



The Radiophone's Meaning

An Advertisement of the American Telephone and Telegraph Company

AN ADVENTURE IN COMmunication was made last January when trans-

atlantic radio telephone service was established between New York and London. There had been previous tests and demonstrations. Nevertheless, the fact that at certain hours daily this service was made available to anyone in these cities from his own telephone, created such public interest that for several days the demands for overseas connections exceeded the capacity of the service.

It was then demonstrated that there was a real use for telephone communication between the world's two greatest cities. It was further demon-

strated that the American Telephone and Telegraph Company, with the co-operation of the British Post Office, was able to give

excellent transmission of speech under ordinary atmospheric conditions.

In accord with announcements made at that time, there will be a continued effort to improve the service, extend it to greater areas and insure a greater degree of privacy,

It is true that static will at times cause breaks in the ether circuit, but a long step forward has been made towards international telephone communication and more intimate relationship between the United States and Great Britain.

Make More Money Read the Money Making Opportuni-

Let Boice Help You Build It!

Sten everywhete are hading it easy to haild it new with Poice Crane Pench Tracklose and books of which discuss which the control of the form of the control of the form of the control of



8' Bench Lathe Part tyring drilling breading, saving applied granding and ig saving the water or and me als Swines 5 taparity ,0 process

All Pairs Markinso drives by M. to My W. P. mater attached to lark pushed. South Mr. Ser breaked today. 1909.

Junior Saw Ones simpling, milerana growing, on ding or indep and draiting with conducting and draiting with conducting the conducting of the conducti Name and start Said with at with-







NO JOKE TO BE DEAF

sted La OCO. W. W. Y. Artificial Ear Brumba. (Son.) Hallman (Sty., Date Wandered, Debuth, High.





emiliate Optible, 36 66 op-Freed, 1 129 Rangey I di, at the Ottoma, Bay Predicts, my toles pent. Write fur-og of pressen 190e imbed-The Latting Co. F-33, Burden, Com.

New Improved SPORS Fountain Pen. 60 Day Trel. Manay bank if not placed AGENTS 65 CSELLS FOR \$1.25. Writes Like a \$7 Pea SAMPLE 65 CMany Make \$10 Duily Easily Comes in Red or Group QUARANTLED New and unment Matt flyder Institut Prape and in my Whitehale speciary f, states abouting from sellers trans all gayts of the monitor E. SPORS CO., 127 Fourth Street, LESVEUR CENTER, MINN.

Ways to Do Recessing

tools should be ground, or set in relation to the work 2"

"It depends greatly on the job," re-plied Grimes. "Thu job you have here is nothing but a boring job so you simply set your tool alightly above center and grand it as you would for boring a finishing cut in cast from. If I were doing the job, however, I would run the turret forward to a stop for the proper length at C (Fig. 1); then feed the tool by hand for depth of recess, and finally use a reverse feed of the turret in the direction of the arrow D."

"Why use the reverse feed? Is it any arlvantage?"

"Don't you see. Harvey a pulling cut in less likely to 'chaster' than a pushing cut, especially with a more or less flexthie har. Therefore I would pull instead

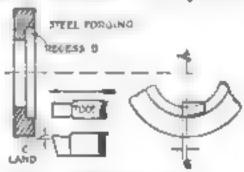


Fig. 4. Without a "land" at C, the recessing tool would dig in hadly

of push. The spring of the bar in a push. cut makes the tool dig in, but when using a pulling cut, it springs away from the work."

"I see what you mean," said Harvey, "but I m going to try it both ways and notice the difference."

ALL right, Harvey, I'm going up to little while, I il stop and see you when I come back,

Harvey got his machine set up and started on the work just as Grimes refurned.

"You're just in time," Harvey re-marked. "I'm going to recess this one with a push cut.

He started the tool and fed it in toward the chack without any apparent fromble.

"There," he said, "it doesn't seem to classiter"

"Let a look at it when you take it out of the clinck," suggested the older man.

So when the recess was finished, Harvey took the piece and held it up to the hght

"Do you see the chatter marks all along the inside?" Grunes asked

"Yes sir, I do," acknowledged Harvey "but they don't do any harm, do they?"

"Any kind of chatter is bad, because it andicates vibration," was the reply, "and this is barmful for both tool and machine Try it the other way now and see if it um't better."

So another piece was recessed using a pulling stroke and afterward inspected in a strong light. To Harvey's surprise there were no chatter marks apparent,

"I guess you win again; it's certainly better this way," the youthful machinist said beartily.

"It's a good thing, Harvey, to avoid (Continued on page 101) vibration, no

Ways to Do Recessing

Continued from page 100)

matter what kind of a job you are doing. For example, in a case like this Fig. 5), the work A has a recess at B for the thread, and while the recess itself in not important as far as accuracy goes, the tool C would have to be sharpened pretty frequently if there were any chatter."

"Why, we have a job miniar to that," said Harvey, "in one of the big gland nuts on the number set compressor. I've done that job several times and always have had trouble with the recessing tool. I would be glad to know how to avoid

M. "Well, Harvey, look at this enlarged section of the work at D. Here's the tool E which must be above center with clearance as undeated. If the cut is deep, stone the tool a little all around just under the cutting edge at F to give it a little 'land.' If you do this, you won't be blesy to latve may trouble. "What's the idea?"

"WIIY, the little 'land' acts as a support under the cutting edge and prevents the tool from digging in."

Grimes walked over to a pile of forgings (shown in Fig. 4) and pseked up one.

"Here's a good example right here," he said. "You have a lot of metal to remove

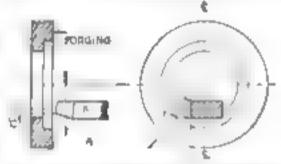


Fig. 5. Packag steel with tool as well above the setur to give a river absoring rut

when you cut that recent at B, and if you are not careful, your tool will chatter budly

"Well, I'm not going to do that job,

so I should worry.

"Oh, I thought you were auxious to learn all you could," Grimes chuckled

"Now, you know I didn't mean it that way ' Harvey exclaimed in apologetic haute.

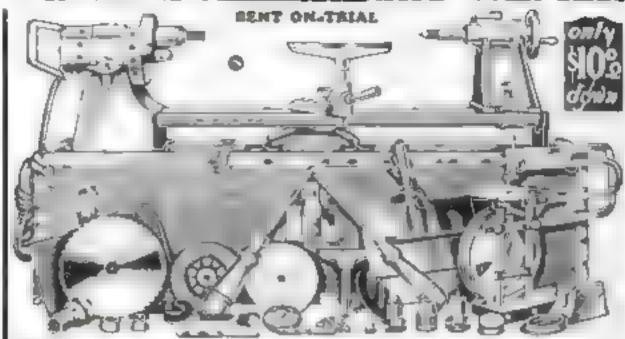
'I've already given you the idea. Let's see you apply it."

"Do you mean that I would stone a 'land' at C on the end of the tool?"

"FHAT S the idea exactly," answered Grimes. "The land will prevent the tool from digging in even under the pressure of quite a heavy cut. If you fred the tool in the direction of the arrow, it will certainly chatter unless you dress it as I have suggested. Then again, in a facing cut which will have to be made across the same piece (Fig. 5 at A), the machinist will have another chance to use his bead. In granding the facing tool B, if he grands a little 'land' at C and feeds the tool outward, he will get a smoother cut and less chance for chatter,"

"Should a facing tool be set on center or not?" asked Harvey "I shouldn't I untinued on page 102, think it would

NOW! MAKE THINGS AT HOME WITH THE NEW RED JACKET HOME WORK SHOP



MAKE YOU A CRAFTSMAN

TYXII'S energy-ally deven that will make you an accomplished workman It is a chart full if times that has been designed by a master for the proute of tool lovers and men who want to build, construct, avent and crease at home. You will be able to hake everything attractive odd furniture, t ye home and an den unpresentation, all at and manufacturing, repairing

The WACO Quarantee If it is Not West You Want When You Ket it Bond it Both

Special Crafts Course And bisuppers per them to little to little during the fact of the last during them to little to little to the last the little to little

Our de Vour Oue Turent Fraja (10100 de un Fater al des regions foi des fater un 2 p par ses et plate à se ne herdabige le mit à

Interesting Literature Free or next the respect. The soft is present note of streetment Bench-er Instruction Sucrementing, June

Everything Explained in the Librature

The complete equipment consists of the powerful Red Jacket Motor, with direct drive to an accounte wood turning intho capacity 9 on a 24 in a bonch new that has depth and side dauges: scroll and jig anw and all accessories for both portable and stationary power or lling buff ing, attending and cleaning. At taches to any light socket and conwerte your work bench into a complets prieste rool and machine

10 DAYS' FREE TRIAL

Our literature tells you how to six a jud-of your man. If you are not pleased retern the Hump

2 OUNCES

of topoten by reading will be sent you should be company better 160 hack are with we send your it a three ब्रोडियोग विकास विकास स्थानिक स्थानिक

WACO TOOL WORKS, Plante Chicago, Ininois.

Manager, Dept 4. Presse send me particulars about 10-day from trial, from bicogratus, and \$10 down payment.

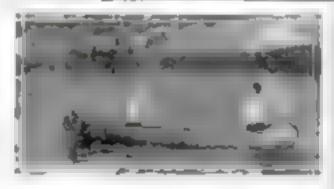
Statute.

(PURSE

BLUE

PRENTS

Addition



A recipe for sheer contentment

Ove "Old Town Curoc." One shumon infand lake. One west seasoned partner. Two bags of dorfle.

Stow the duffle aundalups as your partner takes his place in the bow. Now rate the "Old Town" onto the lake and has abourd. Stroke the water gently with your puddle. drep easy strokes. Soon, perhaps, puril find yourself whisthing softly to the rhythm of your endig

& d Town Capper" glide forward at the of chiest the of the blade. Strong and sturdy inc. Perced \$58 up. Fram dealer or lastery

Free illustrated catalog shows sailing Carrier, square stern carroes for authoral motors, diaghier, etc. Write rodey Oca-TOWY CANDE CO., 1794 Main Street, Old Town Mante.

Old Town Canoes

Belping You Do Many Jobs PLASTIC WOOD



Wherever would need to placing. FLASTIC William with during job quickly and parres mently This seminetable material handles lke party and hardent late (ough, water tight would

towing Working towning Grading Buffing Payshing Cabband

Cabinat Making Scrail

Bawing Drilling Regalring Date Labing

talling Functing Jeinsting Strangering Saraten Pul Baston Pul Bast

Abit comes from the can.
PLASTIC WOOD can be shoulded in the fingers and is we adhesive that it ricks to metal, cloth or weaden surface. It hardens on exposure to his and can be worked with one would be the pattern of the pattern o

formitum, of mily wonderschild

Sold of Hardware and Pales Stores, Kills. Merene gound, \$1 00.

ADDISON-LESS IE COMPANY

** Bottrar Street, Canton, Mass.

Please cond on 14 fb. on of PLASTIC WOOD for which I student life.

Address:

Pipage write plainty:

"B" Eliminator TESTING **Problem Solved**



TO GET full value from your "B" Eliminator you must know that your "B" Power is delivering the right amount of voltage to detector, amplifier and power tube.

Low resutance voltmeters suitable for testing batteries are worthless for testing "B" Eliminators. This specially designed High Resistance Sterling is accurate for both.

Whether this volumeter is used to your business or for your own set, it is essential if you want the facts about any "B" Eliminator. Also tests all D. C. circuitte

On your answers to these questions rests the success or failure of any "B" Eliminator you use.

Does your "B" power actually deliver the total voltage your set should use?

Is this voltage properly adjusted—so that detector, intermediate and power tubes are getting just the right amount each should have?

Have you made the mutake of trying to test a "B" Estminator with a voltmeter which was intended for nesting batteries only?

Are you using too much volcage, thus overloading and shortening the life of yout tubes?

Only a high resistance volumeter will help you answer all these vital questions. And naver before has such a meter as this new Sterling No. R-415 been available to the public.



A laboratory mesey at the remarkably low price of

THE STERLING MPG. CO.

2831 Prospect Ave.

Cleveland, O.

Ways to Do Recessing

(Line)

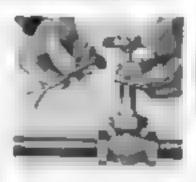
make much difference on that kind of a

"On cast iron it doesn't make much difference," Grimes answered, "but on steel, if you set the tool considerably above center, you get a abearing cut (as shown at D) and the chip separates from the metal with a smoother cleavage."

"I'll try it out on the next job I get," promised Harvey

A Two-in-One Packing Tool

FOR packing the bonnets of globe valves and other small stuffing boxes, a handy tool may be made from an old Ford engine valve. It is split for about 11/4 in. One prong is drawn



The tool is made from OR AUTO SOCIOE VENTE

into a small book for starting and ripping out old packing; the other side is drawn to a blunt point for pressing in the new -F. W. BENTLEY, JR.

Making Small Faceplates

FACEPLATE castings for very small lattice are not always available, but ordinary fron pipe flanges answer the purpose quite as well. Obtain a flange with a hole small enough so the threads can be drilled or reassed out, then tap or taper the hole to fit the nose of the lathe spindle. Put the flange on the spindle first with the back side out and turn it, carefully forming the surface that comes against the collar if the plate is one that screws on, then reverse and turn the face and edge. The groups soft and machines very

Sometimes blank flange eastings can be obtained, which makes the work somewhat easier and allows more latitude in the size of the hole for the spindle hose. Chuck mounting plates can be made in the same way.—Howard GREENE.

Self-Tightening Vees Grip Tubes for Drilling



The stock is quickly

chapped for drilling

FOR drilling Cross boles in round stock, as for cotter pins, these self-tightchilling veen save time. The jaws are made from M-12. sheet steel, bent and drilled.— H. M.

Keeping Dampness from Sills

THE sills of small buildings resting on wooden posts can be prevented from absorbing moisture from their supports, and thus rotting, by laying a few thicknesses of asphalt roofing on each post before the silt are put in place.—A. M. G.

Remarkable PLASTER for PATCHING



YOU can patch holes and cracks in walls A or ceilings easily and quickly with Rudand Patching Plaster. The patch will not thrink at plaster of paris shrinks. Neither will it crack, crumble or fall out. It's as lasting as the wall steelf.

Easy for anyone to use because it does not dry or "set" instantly. The handy carcons come all ready to use, Just add water and apply.

Paint, wall-paper and hardware stores sell it. If your dealer hasa't Rutland. we will mail a package direct and you can pay the postman 30c. plus postage. Rutland Fire Clay Co.,

Dept R-8, Rutlead, Varmont.



Rutland Patching Plaster



TOOL CHESTS For TOOLMAKERS and Marhining Finest Quality best traversed, a young construction inside them worth much more than they man

B. GERSTHEN & SONS SIDCulumba St. Daylon Ulin



Dem. P. S. 30, 130 Liberty Street New York Your Cont and Vest Can Be

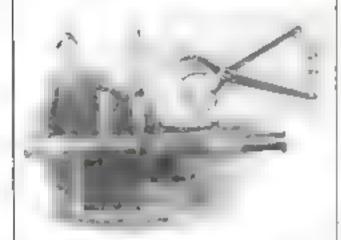
Matched with New Tron Sare the price of a new salt. We match huntreds of cours and costs miletary parties every day l'ach pair turbrest to your measure. 40,000 juit erts. We sufmit sample of thish for your approval. Just man your see or a sherple of the pub. We employ as gorner.

ACME PANTS MATCHERS L. Dept. HC15, 31 W. Jackson, Chicago

road to success. See Money Making Opportunities on pages 116 to 143.

🕒 This seal on a radio, tool or oil burner mivertisement eignifies the approval of the INSTITUTE OF STANDARDS. See page 8.

Tongs with Wide Jaws for Handling Axles



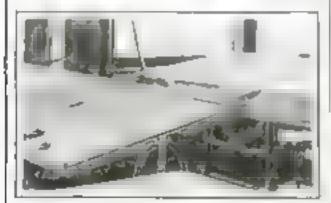
The tongs are prepared by welding curved sections of old boder plate to the jaws

TWO 6 by 8 in sections of old boiler I plate, welded on the jaws of tongs which are suspended from a regular air host, make it cases to handle beavy journals in a Denver wheel shop. The sections of plate are curved to fit the journals. They are more quickly adjusted and give a much better control of the work than other devices that were previously used.—JOSEPH C. COYLE.

Window Shade Used As Cover for Drawing Board

EVERYONE who has left a frawing board overnight known how assagreeable it is to return the following day and find the drawing covered with dest and dirt. Sometimes a loose cloth is put over the table but that is likely to blow off, or to carry instruments with it when taken off

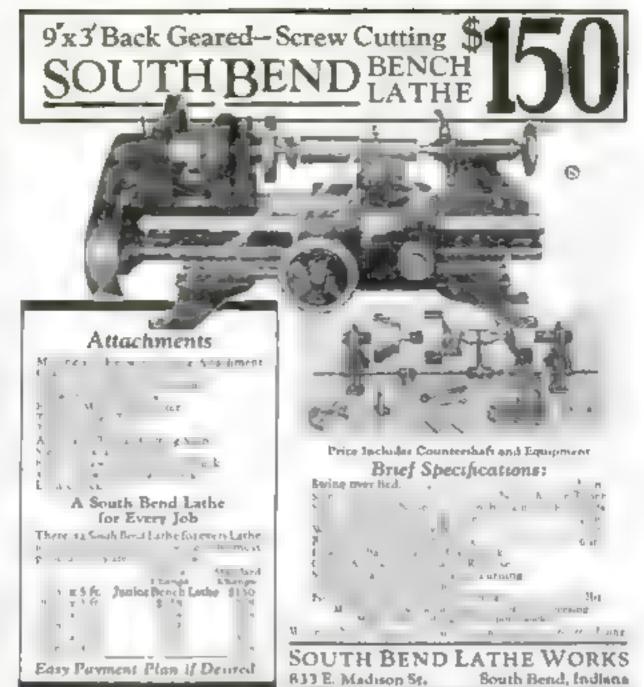
A good scheme for moteeting the board. and tools in allowe in the accompanying

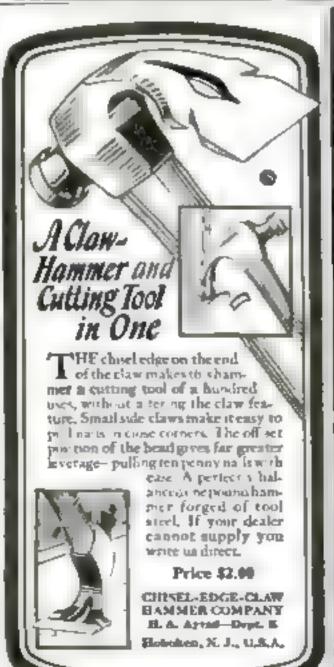


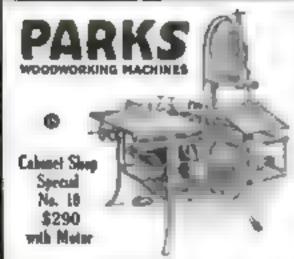
Window shades are mounted on these drawing boards so that they can be covered quirkly

illustration. A window shade roller is fitted to the back of the board so that the shade may be pulled over the drawing. It in readily rolled out of the way, and if the front end is lifted about a foot from the board, it will roll up without disturbing drafting instruments, reference sheets or anything that may be on the board. -Avery E. Ghanville.

INTIALS and figures may be etched neatly on steel with the aid of a rubber stamp. Apply asphaltum varoush to the steel and adow it to become somewhat hardened, so that when the stamp is pressed against it, clean cut lettering will be imprinted right through it to the steel. Then apply an etching fluid with a medicine dropper.







You ought to have this handy Parks in your shop. It is a compact, complete machine designed just like a big production outfit at one-fifth the cost. Includes 8-meh circular rip and cross cut saw with polished cust-steel saw table, 16-inch band. saw with tilting table for bevel sawing, franch jointer, and motor operating from any light socket. Just plug in and go to work! Fits in a corner of your basement. Does any kind of cabinet and joinery work. Add lathe, shaper and other attachments any time at small cost. For the man who does "odd jobs" in his off time this Parks is a big money maker-Turn out as much as a four-man shop working by yourself

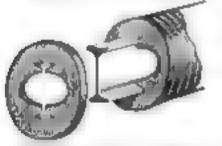
> Write for circular and Purks complete catalog of handy woodworking much intry

The Parks Ball Bearing Machine Co. 1547 Knewlton Street, Cincinnati, Obio Canadian Factory: 208 Notre Dame East, Montreal, Can.

Can't Break or Loosen Prove this Yourself

Bite into and pull the head or clench of a 60d spike or pin thru a 4 inch plank.

FORGED in ONE PIECE of Fine Tool Steel, Grip of Bole Leather Washers, pressed and riveted between the aboulder and steel washer.



Estwing "Unbreakable" are the New Era Putented Tools.

Adopted by the carpenters.

2. Used by large industries where all others failed.

& Approved by university and wholenalers laboratories.

Have Unbreakable strength.

Easter and aurer drive. Finest grap and feel,

7. Unsurpassed temper 8. Weather proofed, absolutely

9. Appearance as superior as quality.

10. Unbeard of value for their price.

Quaranteed "UNBREAKABLE" by our "Free Replacement" Tag and SUPERIOR IN EVERY WAY OF

Using Estwing "Unbreakable" is Leadership

Show this to your dealer be will be pleased to serve 300. Or send money with noder inclose 15c ears for

4.60	h loui ard	eted v	risian yanya y	podžuje	er jus	maid beid.
	Corved	Claw	Hammer,	12 oc.	Hemi	\$2.00
		p.	++	16 "	46	3 08
П.	6.6	6.6		20 "	44	P 96
н	Strateb	è		12 **	p.m	2.00
н		1.0	44	JE 44	14	9 30
Н	- 11	**	41	20 "	м	T 35
	Raif Br	tebat	No. 2 Sm	ooth E	THOU .	2.25
	.,	A.	₩ Sco	ered.	н	2.25
	Util-ax,	19 au	with Les	ther 8	beath	里 25
\mathbf{n}	Sout A				8.8	2.00

ESTWING MFG CO., Resklord, III.

A Job for One in a Million

(Continued from page 13)

cracked motor and were lost for four days in the Everglades. Their only companions were rattlesnakes and vast swarms of meaquitees. All that stood between them and starvation were a few hars of chocolate and two cans of beans, Finally they were found and rescued by one of a number of surplanes sent out to search for them.

TAST year Smith again was in the Iropies engaged, with T. Glass as pilot, in photographing territory in the valually of Tampico, Mexico. They were flying low over busby country where bandits had been reported, when they suddenly were made the target for pot shots below. All at once they felt the plane sluver, and they knew it had been bit.

Glass completely cut off the motor and glided down, and no sooner had they landed than a dozen armed bandity rushed toward them. The airmen, unarmed and powerless, thought they were done for. The Mexicans, however, were mmediately struck by the strange instrangent which the flight seemed to guard so carefully, and crowded around the camera in children currosity. Glass, who could speak a little Spanish, tried to explain that they were merely photographing the territory for a Mexican company. Both men, however, were held prisoners for several days before negotiations with the bandits brought about their release.

The experiences of Major Hamilton Maxwell in making close-up photography of Nugara Patts and the Gorge in July. 1970, illustrate how from nerve alone sunsetimes carries the photographer through a ticklish job in the face of danger. From the moment he and Ford McCarthy, the pilot, took off from a small field on the Canadian side, the thrills began.

"THE field was much too small for our plane to getout of with the heavy load we were carrying," said Major Maxwell, describing the trip. "To clear it, we had to soom over some seventy thousand volts in power wires at the far end. These wires were forty feet up, and we didn't leave the ground until we were shout fifty yards away from them. Never will I forget my feeling of relief when I looked back to are the tail skid eleaning the last wire by about one inch!

"Such a beginning left me none too calm for the job I had undertaken. However, we had to get the photographs And then, when we flew down close to the falls, we ran into molent bumps, the like of which I have never felt before or since. We were drenched with aprav. I became violently ill. To make matters wome. McCarthy, in his zeal to get me in position for the photos, made the old ship do Immelmana turns and nearly every other flying trick during the twentyfive minutes we were there. The last straw was when McCarthy decided to finish up the job by flying under the Suspension Bridge. The rest of the trip was virtually a blank, until I found myself lying on my back at the flying field in

Buffalo. But I got my photographs, one hundred and farty of them."

In Uncle Sam a Navy is one old-timer who has survived a dozen close calls, not the least of which was an almost miraculous escape in the Shenandouh disaster. He is Lieut. W. L. Richardson, chief photographer for the Bureau of Aeronautics. When the Ohio storm sent the "Daughter of the Stars" to her doom. Richardson managed to cling to the careening wreck until it crashed to the ground. Then, his right ankle enuglit in a wire, he was dragged downhill underneath the slap. Only by rare luck did he survive.

T ANOTHER time Richardson went A aboard the dirucible Los Angeles to take charge of naval photographers detailed to make photos of the solar eclipse of January, 1925. And at what risk! Mounting cameras on top of the dirigible, Richardson and another photographer, Peterson, calmly took still and motion pictures at a height of 8,000 feet. and at a temperature far below sero Their faces were frozen, but they stuck to the jub.

Another world famous air photographer is Captain A. W. Stevens of the Army. Perhaps his greatest exploit was the history-making flight of 1024 when, in a plane prioted by Lieut, J. A. Macrendy. he photographed the city of Dayton, O., from an ultitude of \$1,000 feet, or nearly see pades, which at that time was a twoman world record. One photograph covered an area of nineteen square miles and included almost the entire city of Dayton.

Less than a year later, Captain Stevens, as a member of the Alexander Hamilton Rice expedition into the jungles of Brazil, rasked his life in a flying heat to take photographs of territory never before seen by white men. With Lieut, Walter Hinton, who piloted the Navy plane, NC- δ_i across the Atlantic. as pilot, he penetrated 120 miles farther into the dense jungles than any other explorer ever had gone. Traveling light, neither man carried any firearms. A machete and an az were their only weapons in case of a forced landing, and these would have been almost useless against the poisoned arrows of the savage tribes which infested the region.

THESE are typical of the kind of men who are following the faccinating new profession in increasing numbers. Yet none of them are foolbardy adventurers. To them the science of mapping the earth from the sky is a real man's job. Most of them are married, and many of them are rearing families.

This summer, undoubtedly, there will be trans-Atlantic flights between New York and Paris; perhaps a flight around the world for a speed record. Certainly there will be more expeditions into the Fur North. And you may be sure that plenty of camera men will be applying for places in every one of these expeditions.

Tishy

(Continued from page 16)

longer wait, with slow, careful turning of the sexioni tangent screw. Then Tishy did an amazing thing. He leaned against the rail, stared apward at the bridge, where Debron stood peering out at the lightship through the clus, blackness, and laughed quetly.

LET bem find out. It's a man's job!" be muttered and again tried for the star, gut it, and went below to work out the poution. from the result.

When he got the position line ready from his observation, Tishy smoked a cigarette before going to the chart room to lay it down on the chart. Debron, of course, had a line, too, but mage he had packed up the light he would probably not be in any hurry about laying it down. Through the darkness astern the light of the windjammer blinked fitfully. Windjammera were never famous for the quanty of their lamp. on. There was a whose in the sie, although the snow had stopped, and the running seas overands had a queerly virtuus look as they curaled along the basek steel had. Take threw the eignette butt over the sine and started toward the chart room. Pageog the bridge Isdder be heard the captain a voice nor-Ye-

"That lightship is adout?" Stop the ship and

take a bearing.

They went made sumbing. He had seen that the light-hap was sorret Debron had not. The Old Man had found it out. That would fix Debron. The lag, cockours fellow would hear all about it in the morning. It was a good thing the passengers were all saleep. There would be nothing to warry about, since he. Tinky, had a fix which would at least help to place the ship. But when he laid off the posi-tion one on the chart, Tuhy lost his smile. He stepped autsule quarkly. Sought for the light, and could not find it. Instead, there was a small light such as an anchored vessel shows on her furestay. The lightests a people had discovered they were adult. And almost at the moment when Tishy discerned that small light. there was a shout from an, that the momenturily forgotten windpromeer in tow was close. under the stern, anable to stop when the steamer and stupped for the bearing. That old wreck down by the head with ice, was samply anal se to sheer clear once the pull of the towline

et ap. "Slow ahead port. Helm-a-port," the raptain ordered, and the big steamer began to move in a short are. Then the lookout in the foremost crow a nest, ignoring the speaking

tube in bu exeitement, ye set " Breakers ahead and to port!"

TISHY was at the bridge ladder. He felt go ity. He had never meant to let Debeon get into quite that fix.

Hard a-port? Full ahead port engine, half abend starboard." the captain cried, auxiously, peering out into the blackness where a venumons white hise seemed sundenly to stretch

The steamer forged ahead, gathering speed.

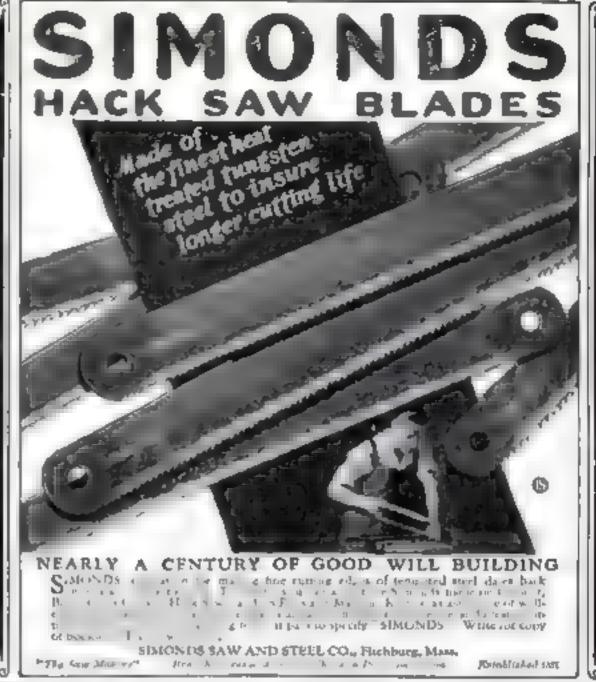
"Look out aft, there.

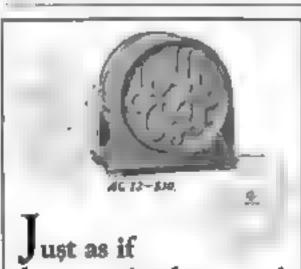
The towine twanged tight. It mapped where the see of the windingsport a busin cut it. The shock of the breaking wire was felt forward, but not nearly so tremendately on was the fe lowing shock when the wire fouled the steamer's propellors as she turned.

The terrific jar shook the steamer Officers doors opened. That remember crash would awaken the Seven Sleepers. The belinsman in the wherthouse and, in a cool, duty tone.

She don I steer, sir-

"Quartermatter' Call the chief officer," the master said. Tishe was at his side. "Get. an anchor down querkly! Have the other clear Dehron, see all hands are called. Stewards too. Got to keep the (Continued on page 108).





he were in the room! The Amplion Cone is remarkable for its clear, crisp reproduc-

tion of speech.

THIS is the supreme test of all radio reproducers, especially those of the Cone type.

The heart of this Cone, as with all Amplion models, is, of course, the matchless Amplion unit which is a standard of comparison in radio reproducers throughout the world.

> Other Amplion models range from \$12 to \$135



THE AMPLION CORPORATION OF AMERICA Saim M., 280 Madigon Avenue

New York City



in the handy package

Carries complete Illustrated directions, Faough for four new cords. A screw driver is the only tool you need. Eliminates delays and repair bills. Guaranteed for 20 years.

The Handy Package is just at handy for other uses: sled or coaster rope, hammock or swing rope, touring and haking kets, Boy Scout outfits, etc. The Silver Lake Package is a family necessity,

If your hardward douber have t if, plaque use the compan below.

SILVER LAKE CO. Mfrs. of Solid Braided Cardege, 315 Novela St., Nawtonville, Mass.

SH.VER LARE CO., 222 Reveals St.,
Special Strain Co., 222 Reveals St.,
Special Strain Co., 222 Reveals Str.,
Special Strain Co., 222 Reveals Str.,
Special Str., 222 Reveals Str., 222 Reveals Str., 222 Reveals Str., 222 Reveals Str.,
Special Str., 222 Reveals Str., 222

ASK .. ANY .. RADIO .. ENGINEER



The Crowning Adventure of Burgess Radio Batteries

They Flew Over the North Pole with Byrd

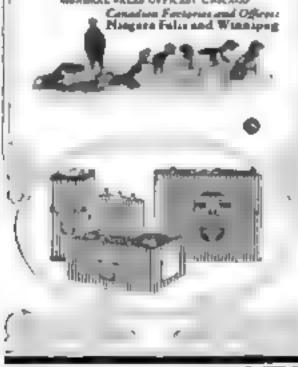
ON May 9, 1926, history was made: American history, World history, undying history.

Lieut, Commander Byrd, in his fearless 1 you mile flight across the top of the world, adds another thrilling triumph to the long, proud but of American achievements.

Radio went along, for radio has become vital to the lives and success of explorers and adventurers. Burgess Batteries went along, sharing the face—sharing the hardships and the glory of Commander Byrd, the Detroit Artic Expedition, and Capt. Donald MacMulan.

It is reminently significant that is these abritions triumphs of American countries and American enumperate wheth the test of men and dien too is was the test of the sure via of the fittest, that the transland products of the Burgers Burtery Company were extended, used and instruct on under entrume and approximatement conditions.

BURGESS BATTERY COMPANY GENERAL VALUE OFFICES CHICAGO



BURGESS RADIO BATTERIES

Tishy

Learned from some 1 25.

pameagers from going butty. See what the town duing, quartermaster.

In the glare of great cargo ares quickly fixed and lighted, the scene was revealed as in sunnext day ught. Testes and his gang forward, letting go an anchor. The lightship, its riding light flackering, anchored well clear of the breakers. The windjammer swinging along with her head bowed down under her burden of ice, personaly close to the Doolese neurer vetto the menace of the reef, her forlors crew futilely attempting to chop the see from her forecastle beau to get at her anchors before she went atterly to wreck. Sparks, in his little. shack, seen through the open door, calling, ca mg. through the either for assistance. A blinker lamp on the lightahip telling the windpatienter to anchor and an old man on the windpammer waving his arms in parturesque appreciation of the irony. Decks rapidly filling with frightened pamengers, awakened by the erash of the lost propellers, and sent into a mild panic by the sudden territe rolling of the steamer as she turned to the sea. Stewards going among them, assuring them that there was no danger. Many passengers accepting that assurance. Three hundred terrified steerage people refusing to believe making a nous rush for the boat deck restoulding their noue in the glaze of the great are sample.

1341 Y doubled aft when the anchor definitely held and the eleumer stopped drafting. He retald take in every bit of the scene. It was no comfort to him. How well he could see that all of it was no to him! Had be not been so lutter, he would have told Debron that the lightship was admit the moment he mw it by his textant angle of the moving light with a fixed star. Then the course could have been altered without funt, the tow would not have moved up, shelting the line; the towline would not have inapped without that about shock of tachtening again, the steamer would not have hot begpropellers, nor need that old windjammer, with her atableon old man and compagning rick be at that moment drifting fast to destruction in the breakers.

As he recalled it all, a savage anger seethed through how for that moment at least be justified howelf blancing Debron. If Debron had not been in officious about that betout jub. If Debron had never been so dawned putronning if Debron had never been so dawned putronning if Debron had never been so dever with his nocloumer—Tishy powers! through a swarming mob of steerage folks, all screaming and lighting about the bouts, refusing to listen to the stewards or seamen. Tushy seised hold of the first one he collided with.

""peak Engish?" he yelled. The man unewered in a mouthful of gutturals. Tishy tried another. He tried many, then a man answered with a stomachy, remisting. I aw

"Then tell 'em the ship's anchored, that they're safe. Go on, shout it out before somebody a killed."

THE man bawled the assurance. There was chosed to their took it up. Soon the mobrone was leavened with voices peaching accurity. A few refused to believe. Some milled about the forward took, and as he fought his way through, to get to the bridge ladder, Tishy saw blanche Torrey and her father present against the rail. The girl was paid faced, but holding a brave front. The old fellow seemed to have shed his invalid's role in the emergency and was doing his poor best to protect his daughter.

"Oh, here a Mr Berton, father! He'll look after us, the pri erest, and Tushy felt the hot blush flooding his face. What a fine protector he had shown kinself to be! Even that old colouel, age, weakness (Continued at page 107)



A simple as stepping on the starter button of your car - that a what End
tand there in means. Merely a quarter-torn file of the fly wheel-finger-tip care
and your E to started Off you speed for
favorite fish at grounds, friendly it into
cover, or companionable truine
toward beckening shores.

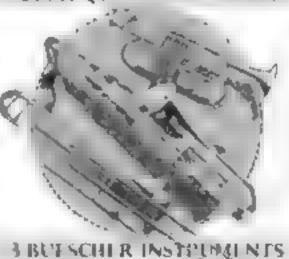
Lituminas offerseeny quarterturn marting because for
alone in equipped with full
battery plus Atwater Kent
ignition. Tens of the second second in the seco

Ok Evincede President

Dept. W Meson Street, Milwaukee, Win



SUPER QUALITY IN THESE



Take One Home on SIX DAYS' TRIAL

WHAT is your favorite wind introment? Samphone Trumpe. Trombone, Cochet? You can have any Buesther you channe for 6 days trial at home, This practs to under no obsertion to buy I you are not satisfied it you keep the born, you pay a base each munch while you are learning Send posts, for cataling and details of this wonderful plan. Now it an ideal tune to start.

BUESCHER BAND INSTRUMENT CO. 1976 Buescher Block Elkhart, Indiana



Destors, Agents, But Suiders — set our big 127 Catalog 225 nationally advertised fate. Lowest prices in America? Largest, most complete stock, Radio a launt developments, It s PREE: send for your copy now. AMERICAN AUTO & RADIO MPG. CO. Inc. 12th Bedoo Street, Record City, Sc.



G E A R S

The mant unmersion rouds and preven prescriptable. We control a geomicipabane of grapp in march for immediate a sixuamuse. Can also questo un appendie greaty of all kinds, stand on your in-

Write for Catalogue 274 CHICAGO STOCK CEAR WORKS 105 Seeds Follows Street Cleans

C This seal on a radio, tool or all burner advertisement algorithm the approval of the INSTITUTE OF STANDARDS. See page 4.

Tishy

and all, was proving a better man in the pinch. He was being hustled about, and was clearly not strong, yet he thrust back the rabble, facing them with gittering eyes that shot indigneat fires straight down his eagle nose, calling them outrigeous names which they could not understand. Tishy darted to his room, got his pistol, and was back beside the boat in two m nutes.

"Take thu, colone), and use it if you must," he mapped, and then went up to the bridge with his report that the steamer was securely anchored. Thick flakes of mow fell athwart the blackness of the might outside the are light glare. The captain anxiously watched the crifting windjammer, receiving Taby a report with the curtest nos. That old saling ship was fast passing beyond the limit of assistance. On the lightship the blinker had reased its fatile agualog, the crew were trying desperately to get their boat languised. It was frozen up solid, just like the windjammer a uncliore and gear

H CRRY with that boat, Debrow'" the cap-tain shouted. Tisky started, followed the captain a gaze, and saw that which shocked him back almost to the offer mood he had last lately cost off. Debron and a crew fought to clear away a host, and the frensied mob, only just reasured by the steamer a anchoring, once more went crasy at eight of an officer and men teying to lower a lifeboat. It was useress now to tell them there was no danger. I seless to tell them only a rescue of that windjammer was intended. What had they to do with the windjammer? If she struck, what of it? Were they abound of her?

But what Thely new more vividly than anything else, was that Debron again had been chosen to take a line arross to the unperiled ship. He saw, too, that Debeon could never get that boat away in time to save the windammer from striking. If she struck, in those roacing breakers, there was small chance that her placky old skipper and erew could be saved. And it was all because Debron's sense of bomorcreated Tishy as a nekname That was what Tisky trust to mentre humself, while swiftly seeking for a solution.

Jump down there and help Debron heat off

that rabble, said the captain to Tahy and the two purpor officers standing by That a no use. Too late, muttered Tahy. and took the ladder in one footless slide, hands on the moderate, The paraors followed, burning themselves asto the mol. and speedily swal-lowed up by it. Tishy had seen where the books had prepared coiled small lines, ready for the boat. He was lost to sight for a moment, as the juniors had been. But soon a shoul went up, and men who a moment before crassly mobbed the lifeboat craned their neeks to peer out upon the hosing wa. The can colone! fired a couple of shots into the sir in his excitement. and perhaps they did more to quiet the goob than any amount of manhanding. And then up went a shout that made the other sound like the sigh of a sephyr. Debron uttered it.

TISHY'S crasy' Hell never make it's Swing out this boat lavely, or he a gone? Perhaps Tisty heard. Out there in the sey sens, swipping ng like no otter, with a beaving fine snaking out after hon. He flogged the water flercely shaking his head to clear his eyes each time he emerged from a source crest. And the same men Debron had stationed at the stern of the steamer to clear away and pay out the lines, did that service now for the awimmer, awed into amazing alarmis by sheer shock. Of all the Disdem s crew, Tisky was the last they expected to pull off a stunt like that That was another result of Debron's humorous nomenclature of antiqued on page 1600;

HIGHWAYS

this summer~

Your Vacation Hours Motoring on the Water



3 HRS nummer—know the joy of motoring on the week. Go where you can follow may trail you might desire through shady used or clear rippung streeps,

There is no sport like water motoring. As vou bear the cast of distant shores you answer, knowing full well that your Johnson will get there and back swiftly and safely.

This year Johnson Jurcher unbacces in our standing leadership in the outboard motor industry with four motors that are marvals of mechanical perfection. Revolutionary mechanges developments have greatly increased the power of all twins.

If you are considering the purchase of an outboard motor, you own it to yoursell to son -or butter, try one of these new Johnson. motors. Johnson dealers are prepared to sell you on easy payments.

The new Johnson Aqua Flyer (17-feet reshogsny hull, with enclosed Big Twin-speed 18 m. p. h.) was the sensation of the New York Mosor Boat Show.

JOHNSON MOTOR COMPANY 2532 Sample Street, South Bend, Ind. Canadian Distributor Provideraugh Cance Co. Feterborough Out. Can. Erpert Division 75 West Street New York, N. Y. U.S. A.

Johnson Outboard in Motors



Days Free Trial

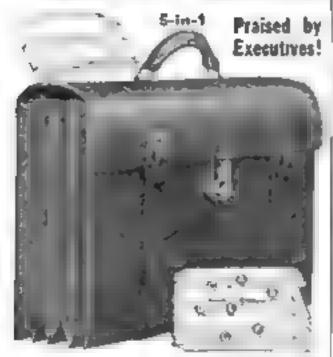


- Historia

PRODUCTS

Mariana (SW) rainana

VERSATILE" Brief Case



YOURS ,.".... ABSOLUTELY FREE!

Parket mentarment rememble Total Ed

C. Phase up Fortige has homers Perform and Brancountie press, much be wide figst sump the said to supera a first trackly use in the said trackly use the said trackly use the said trackly proposed to the said trackly use the said trackly proposed to the said trackly use the

(D) directory provides for abstract, decoding abstract, Law for Percel to Proping Pos.

Personal distriction of the Point process of the second by the Parks of the second by the Parks of the second by the Parks of the second by th

(G) Line and any of side and order to order on the few contains the bottom of the contains the contains

Our Plan

nr If you wish to pay cash or and at 13 75 nr If DAYS. deduct \$1.10 und area for Menny Order for 11.178 in FULL ARTSLESSEST Otherwise seture if Order StrW

SEAVER-WILLIAMS CO.

Smith form, Committee, Mattenut Matt. Coder Mount 506 WASHINGTON STREET BOSTON, MAGO.

Days Fills Think to the shore plan. Committee Committee in

makes.

ADDRESS.

City and mote the spin Tree of Jy a new contracts plant and are contained about the spin of the spin of appropriate and compared for any appropriate and

SALES MANAGERS A -- searchester seasons and and absence of -- tonse

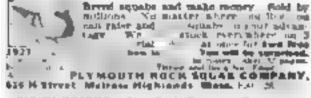


MODEL SHIP BUILDERS

Office year bear a true made! appearance Rig ber up with the state parts and have pour Birrent to broket destatoing Days a burner total

Model Ships Supplies Dage S. 64 Winselast St., New York Cay R.T.

TWO 1927 SOUAB BOOKS



\$25 IN PRIZES-See Cash Prim so Page 116

But Tishy was well away. The windparamer wallowed down the wind, past the steamer, and at the nearest point was no more than fifty yards distant. But she moved fast. The reefs were not much more than a hundred fathoms astern of her. Debron coats not get his boat clear. Passengers who before fought to get to the beat, so whiting in a mode along the rada and davits, gaping at the little speek out in the hit ng coid sea which was a human being

My Lord! He's a gone goose, and so's the windjammer!" That was the cuptain, up there on the bridge, full to overflowing with worty chough.

"They are him! They've got a fine to him!" Thus the box'n, tending the lines.

"Oh, father! Tell me. I decen't look! " This from Blanche Torrey, hiding her face against her father's cost. Then in the pext moment bravely facing whatever might come, scanning the water, biting her lips.

IN WITH you, lade! Lower away smartly!"
Debron at last had has host clear. But too late, unless Tishy had gut his line across. The hont was lowered, just the more. And the windsammer seemed to awing faster towards the breakers. Then a line snapped up from the ees A shout from aft. Men aboard the windsammer frants ally hauled in the line. The hos'n a gang flung out coil after coil of bigger bines, and these, too, were hauled over until a hawner stout enough to secure the windpammer to the deamer was gotten as all of But the windjammer's stern was at the fronge of the surf A black shape was enough affway up the feesew ude of her on a rupe, and auddenly dropped. back into the sea.

"He a gone"

"Threw hanelf away, that he did"

"The old ship's into the breakers, tou!" Dehrun had bended the boat straight for the windjammer. Low down on the water, he had not seen Tishy fall back and go souring away itsto the blackness. The after winches of the steamer were ruttling in the heavy rope slowly, steadily dragging the old ship back from the paws of destruction into which Tishy had van--

The old skipper of the windjammer was gesticusting and hawling at Debeon, whose hoat was near awasning under her as she came up to the pull of the winches. Then Debron started his men rowing again; and the boot, too, desappeared into the murderous chaos beyond the are lights' radmore.

"That boat's gone, too," muttered the captain of the Diodest. "Two fine fellows lost for an old derelict that ought to have been abandoned at first!"

talls period up, or Two ovens tugs coming out. the wireless operator anonousced. That wun there my men

With the old windparamer houled clear of danger, and the Dissess securely riding to her big anchors, there was nothing anybody could do but wart. Passengers submitted to persuamon and west into the shelter of the saloons. talk in bushed tones of the swift tragedy that had shadowed them within right of bothe, almost. In a corner of the munc mion the colonel held in close arms a quietly weeping daughter; and now he peeded no tender care binnelf, but seemed to have some to spare.

After awhile, word seeped in that the tuga were in sight. That brought out the people agam. But Blanche Torrey remained made. She seemed to have no interest outside.

The tugs circled around the reef; hig powerful seagoing vessels, with searchlights that bladed the eye encountering their bentas. The first and buggest, steutoed alongsule and haded the Drafem. (Continue) on page (08)

Heavy Duty "B" Batteries



Guerenteed f months' Supply of "B" betteries for your Radio-Shipped direct from our fectory

30 DAYS' FREE TRIAL!

We are an ourse that you got be detailed with the ome the said efficiency of his indication backs dury B. to see an use in Bingry See a chip had does in more thanked a see past to and the chip had discrepance had will have an empay to mounthly me the trial register them. to some top to your the highway apprending affections.

Send No Name shapened one or page by the man in the principle of the page has been in the principle of the man are an arranged to the page that are not at the replace has an established one of the page of the p

Austin Assessaries Mig. Company 12 to 18 S. Clinton Sc., BDT 18 Chicago, 1D. References: National Bank of the Republic, Chicago ar year own bank.







Agencie An Planty Standard of the Control of the Co

New bargain curator just pouged. With the curator in the annual relation purpose of the curator and purpose of the curator curator for the curator cur

Mil. 16 Hour Purphase Stead, Chicago III

Here's how to be

B't now amay methods you may tear to play a comparation of a few altrest weeks. Enterthing purposed and your femals figures, for theorems makes you be life of the party you're welcome everywhere.

Pive Trial. Easy Payments on any Conta-juntepment for hand or or bester a Farlymen, dues others. Write today for free literature, C. G. CONN, Ctd., 432 Cone Bldg.

Advice for Popular Science readers regarding safe and profitable investments. See page 6.





Sousa Endorses the Harmonica

"I am a great advocate of the Harmontes," says Lieut Commander John Philip Sours, famous bandmester, "and especially endorse the Harmonica bands which are winning sweeping popularity. This instrument is a foundation for a spusical curver; and many beyond girls who are now learning music on the harmonica. will step into the great symphony orchestras and bands of our country some day."

You can learn to play a Hobser Harman-lea with the a d of the Free Instruct on Book Octa Hobser "Marine Band" tuday and ask for the free book Hyourdealer in out of copies we is M Hobser, Inc. Dept. 182, 114 East 18th Street, New York City.







A 2c Stamp

-will start you on the road to success. See Money Making Opportunities on pages 116 to 143.

(Continued from page 106)

The wind chopped the words, but the megaphone made clear something about a man needing medical aid; and the tug akipper shorted that he would run alongside if the man could be taken quickly. So men stood by. With a trash and a granding the tug and steamer came together. For an instant, the lights flooded both decks with stronger than daylight radiance. Strong hands passed over a bundle of blankets. I prout his shapes risimbered over the rail after the hundle, and the tug sheered off to get her lines reads. Then it was that Blanche Torrey, in the salon, heard that which snatched her out of the colone's arms. and sent her on deck with signals flying in her checks.

Three cheers for Tohy. That was in Debron's your, a bit shaky. And two hundred seamen, and five hundred passengers, gave tongue A crowd followed the bundle of biankets, carried along to the doctor's quarters. The captain went made. Debron ton. And Debruir sketched the story of searching for and finding Pulsy exhausted, so far to beward that the best could make no beadway back. Of night ug the lights of the tugs, and of being picked up out of a sinking limit at last

"The lettle chap a pretty budly french, sir,"

and Deliron . Plucky little devil

All right. Go and look after the towline. and stand by to get your anchor. Tell the third mate to look out aft. And as Debron left, with a peg of the doctor's whiskey still stinging his polate, the cuptain found a slim, trembling girl trying to thrust past him to the

Can't go its there, now.

"Ob but I m a good name, captain Please,

The doctor knew enough about the Torreys to be sure that Blanche was a good nurse Turny would need a good nurse before he regamed has state of normal entirety and wellbeing. He nodded, and the captain gave way

It was a buttered, broused, sorely frozen-Tuny that at last opened his eyes to see who powersed the curesung hand that so cated but agusties. The pained eves closed again after one swift gleam of happy recognition. If Tishy beard any of the many voters that muzmured inquiries near by, he gave no sign. When Deteron called him "Tishy." Tishy's eyes opened for an costant and smiled. There was something of bomage bestowed in the way Debron aftered that Tides now It mounded like the hall mark of fell-walup

Besides, his other hand, the one least badly injures, was beld in the warm grasp of tender fingers that in themselves cradicated any trace

of bitternem left

Seaweed a Valuable Food

T YOU would be strong and beakhy, feast on a diet of seaweed, says Mus Josephine Tilden, of the botany department of the University of Minnesota, in urgang that it be served often as a tasty salad, stew or soup-Not only is seaweed a preventive for goder, by virtue of its richness in lodane, declares Mess. Tuden, but it contains other valuable ingredients, which we now receive inducetly by enting the fish that feed on it, and babies, she says, can digest it as easily as adults.

Paris to Build Auto Subways

FT WILL soon he an ordinary night in Paris to see automobiles auddenly disappear into the ground and as suddenly dart up into the street, if a proposed scheme for rebel of traffic congestion works out acturactorily. Underground passages for automobile traffic only are to be constructed at three of the busiest street interactions to test out the plan-

BRACH ARRESTER



Over 2000,000 Radios are Now Protected by Brach Arresters

Like all Brach Arresters the Storm King is backed by our

\$100 INSURANCE

Electrify your Radio with the Wonderful



Over 75,000 used within First Four Months



TORONTO, CAN



BAYES MONEY—SPEEDS SETPMENT

A Special Way Night on the discover may make up to go a form that begin phonon of our form of the construction and the same of all of the constructions of the construction and the con-dition of the construction of the construction of the con-traction of the construction of the construction of the con-traction of the construction of the construction of the con-well state time, making, and appending abdipments.

S HANDY RIXER-FOR ALL SAWING JOSE Named Way Saw Type 17h alows about for each agreed beautiful states for each agreed to the state of the state

Append Why New Type 170 for heavier work taking a cost in soft or hard word, up in the thence Fruit jury quantum party and specific transfer than

Speed Way flow Type 186, the bin fellow of the Speed-Way fine, handles knything up to 3% inches out. For basey duty wherever there is a light senset. From \$175.00.

All Marcol Way Raws have our patented depth gauge. All he was a makery grand to he was to me of a class to make the last two and are that to handle. Will mark from any taken mothet.

WRITE FOR SPECIAL OFFER.

If you have a naming problems where or done without and full distorts as in which will be expected a long problem through problem with actually been mounts in your position.

RESCTRO MASHETIC TOOL COMPANY 1839 S. Sznd Are Adjaining Chicago Dicorn, His



Address

"Midget" Rheostat with Filament Switch



Game truth and rend builders.

In the early days most reads, the party origins a med has easily origins a med has easily more than the read in mere mode and reads of the read in mere mode and reads of the sales of they be a tradity in the party of the easily of makes a the court of the easily of makes the court of the court of makes a tradity of makes the court of the court th

Any dealer can show you why In Canada -- Carper Radio Co., Limited, Toronto.

CHICAGO

Bare Hands

(Continued from page 88)

ing from the observed should be made at a high temperature, when it will become an excellent reducing agent."

W.lliams looked up from where he was work-

ing on a believe.
"You know, Thornton," he gramed. "I thought my encyclopedus went down with the yawl, but it didn't

Thornton paid no attention to Widness a attempt at humor. He was deepty pleased in think that Parker should have proffered any information. It would not have surprised him if his partner had utterly refused to aid at all. But the few days that had passed made Parker feel a little less optimistic about heing rescued. by a passing ship. He had endeavoyed to man some sort of signal that might be erected, but his trand had conceived of nothing save such contrivances in would have to be constructed an a furth requipped factory, and he was discouraged accuesting a Furthermore, while he had made isn of the rabbit bunt and of the austathat Oomak had made, he had been very pleasantly surprised when he was at last fully dressed once more. His suit did not look as if it had come from his tasker it in true, but it was

BUT whatever the reasons for Perker's change of attitude, Thornton was pleased. He had no wish to see their friendship stretched. to the breaking point

could help breathing.

very comfortable and warm. That very fact

made him less pervous, less irritable, and cunsequently less incentic. Furthermore, his mind.

was an earlyclopedia of technical information. and he could no more help giving it out when anyone admitted a lack of knowledge than be

"Hut how about your lime?" asked Parker "What the deuce do you want lime for? asked Williams

It a concuttal, replied Parker "It as peeded to combine with the program of the ope and the ash of the fuel a lime a mate or slag of such a composition that it was melt and that on the molten won, and so make it possible to draw of the improver. In add ion, it is peopled for the descriptorizing reaction. Set me see. I think the formula to also year it in FeB + 1 aO - Fr + CaS + CO. In other words. its bity is to this, the gangue and ask and wish out the mipher

Holy smoke muttered Williams "Does all that mean anything Thornt in?

It does, replied the engineer solemnly "It means that we ought to have smestone, hat if we can't find it we may be able to do mmething onywey."

P YOUR smelter works you may admitted Parket. "But the mon will contain all sorts of importion, and its sulphur contest may make it will bless

"Not entirely worthless," corrected Thorsaton. "We can make some use of it, regardless of impurities. Of course, limestone would Hilp.

Parker hughed and a touch of his purcuan

returned.
"Yes," he admitted. "It might belp—a hittle "

But they found no limestone, and so were forced to go ahead without it. It took two days: to prepare enough charcon and to carry enough magnetite to tol the furnace. Comak looked on, meantime in worster unable to understand what all the activity was about

Now what do we do?" asked Kelly when the supplies were assembled. "And how does the bloccom' thing work?"

"You see that depression in the bottom, don't you?" asked Thurston.

"Well, that's the hearth. We fill the furnece up with alternate layers of charcoal and magnelife. Then we set the [Continued on page 717]

" hep.



Giant Chest Expander and

Progressive Exerciser







DIRECT From Packery Wholesale Prices Easy Terms No Interest 57 years proves WITTE must durable, economical - boths almost any hard of face - Sem Seed Construction Valva-in Head Metry-WITT Magnete-TRRUTTIING GOVERNOR LIFETIME QUARANTES.

FREE Improvements, New Low Prices and Long Terms. Also Log Haws and Posspara.

WITTE ENGINE WORKS 2221 Write Building, MANSAS CITY, MO. 2221 Empire Soliding, PITTSSI HGE, PA. 2221 Write Building, BAN FRANCISCO, CAL

SPORT BODIES for FORDS M FACTORY PRICES!



SPORT FACTORIES, Aurora, Illinois



The Midget

"Five in One" Side Rule
by productive Manchests Portuget
rise Log large Mancre And and Adimy Stage lines. Continue type Side
and reason assumption and direction any comlines of assumption and directions. For these
the hard manchests, and the table. the hard manufacture, and floridation is followed by the constraints of the constraint of the constraints of the constraint of the constra

Bare Hands

(Continued from page 119)

charconl on fize and pump our bellows as fast as: we can to create a strong draft. The charcoal separates the iron from the ore and it melts and runs down to the hearth. Other things melt and run down, too, but they are lighter than the mun and so float on it, and we let them run off through the upper one of those two boles. The lower hole is at the level of the bearth, and that will be kept plugged until the molten from man collected. Then the plug will be removed to let the from run out. I've made a place for it to run in the said. Then these holes in the said are molds. The iron will flow into them and will cool and milipily in those shapes I have

What are they?"

'The first in a large barnmer," replied Thornton. "The second is a smaller hammer, and the third is a rough axe blade. The fourth

"What kind of iron will you get?" asked

Walliama.

"THAT is the question," jeered Parker "You may not get any. On the other hand, you may get stuff with so many unparties in it that it will be worthless. That is probably what will happen. Your furner is crude, your air pressure is limited, and you liave no accurate method of amazing your see or of meaniring anything else. The various grades of iron and steel depend upon the percentage of curbon they contain. If you should get gron with less than three tenths of one percent which is impossible—it would be malleable upon, and earbon would have to be put in it before it would become bard enough to be useful for edged tools. If you should get metal. with from three tenths of one percent to two and two textlu percent of carbon-which, became your farnace is no usual is conceivable. but not okely at would be steel, and that would be seen. If, however, the metal contains more earlion than this latter amount it is cant tron, and as such will be more or less meless. I alone of course, he succeed, "you can erect a Ressemer converter."

Or a problem furnace, added Thornton. "That a smoote enough, and we could remove the ex-year carbon, and make steel or mallesbic

Parket enorten

"You presuppose," he argued, "that your metal will be largely free of other impurities, area that a responsible.

"Then are we all ready to go?" saked Kelly.

ALL set " nodded Thornton, "You and Williams oust up the ore, while I get the k is Ding ready. He busted luminest with a pile Nuw pol in some charcoal. that s of steles New ore Now clurrout pauses, while they dumped the materials in "New more occ. That's it. She's full and we be ready

He took a burning brand from their camp fice, threat it through the cinder notch, and saw the kindling eatch fire. It burned up plowly, and he began to pump two of the bel-

lows -one with each hand.

"Get how, he shouted, "and work your

bellows. The experiment is on

Parker stood idly by. He merely watched as the others labored. The bellows thumped up ario down and the furnace grew botter and butter. Flames shot out the top, and the perspiring grown no uped tike mad. For half an hour they worked the rootal skins up our down, and finally Thornton, who crouched near the cinder notch, saw a glowing renduc reach the opening and slowly break over the

Pump!" he shouted. "Pump!" He paused to take off his rabbit skin coat, and went to work again with renewed vigor

"More charcoal and (Continued on page 118)

Setting Big Machines on Your Desk

With this Veeder Counter over your desk, you can watch the workings of big "automatics" as closely as if they were miniatures on your desk. You can check-up on mechanical improvements or operating methods as they register in the output. Supervise from where you sitt-guided by the production-figures on the dial of your

COUNTER

The "Form UM" Magnetic Counter below counts machine operations or units of output electrically communicated.



Mechanical contacts on your machine make and break the electrical circuit which operates the counter over your desk or on conveniently located Counterboard. The electro-magnetic drive can get its current from your regular lighting circuit: Direct current, 110 Volts, or from storage battery.

For machines, devices or apparatus where you can't put on a mechanically operated counter, you can readily attach a contact-maker and get your count "over the wares."

Write for booklet of mechanical and magnetic counters for all machines.

The Veeder Mfg. Co. 44 Sargeant St., Hartford, Conn.

Make More Money

Read the Money Making Opportunities



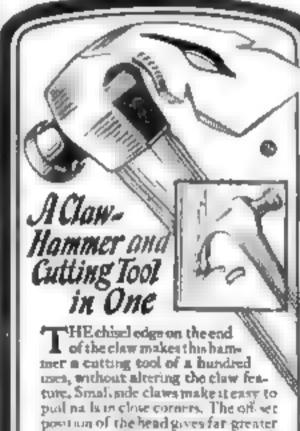
ardized, low mouthly terms - a rong time to pay, FREE TRIAL GUARANTEE

Within an hour or less you master every detail of start of stopping, steeping revening tradings of specials. New Free Iral Guambert tetands money divide satisfied. That's the contidence we have in Evincule superiorny and in your liking this sport Every outings to real rates ion. No reside to less, no way to be reckless. More room than in your car new change to see, new places to go.

New Evinrude Year Book

Motors in actual colors, 40 interesting pages showing beautiful waterways, speed records—complete factal Sand for fore copy today.

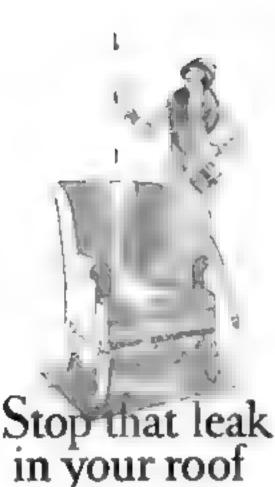
EVINBUDE MOTOR COMPANY 2502-27th Squeet Milwaykon, Win.



ease. A perfeculs basancedone pound hammer forged of tool ateel If your dealer cannot supply you white us usrect.

Price \$2.00

CHISEL-EDGE-CLAW HAMMER COMPANY H. A. Ayvad -- Dept. E. Hoboken, N. J., U.S.A.



TEPORE it causes costly damage, b stop it with Rutland No-Tar-In Roof Coating. No trouble at all to apply, costs little and makes leaky roofs as good as new.

Rutland No-Tar-In provides a perfect coat of asphalt and asbestos-o tough meneral covering. Not a drop of tar in it. It will not crawl, sag, peel or bluter.

Insist on Radund at your hardware or paint store. Save money by mailing the coupun today, Rutland Fire Clay Co , Dept R 7, Ruthand, Vermont.



Rutland No-Tar-In ROOF COATING

BUTLAND PIRK CLAY GO. Dept R-7, Rusland, Vernons Swin, me more information awart No. Tay In-

Name

Address

BUILD YOUR OW



Buy the works. m abby and pen pr as at surpressely THE THE PART IS DOC milding Artista. on your friends.

Plate Starks As Law As 38 48. Debars a in Change of All Press. Ass. So: Attended From 9ths

AMERICAN CHIME CLOCK COMPANY 1479 Ruffner Street Philadelphia

A 2c STAMP

-will start you on the road to success.

See Money Making Opportunities on
pages 116 to 143.

Bare Hands

(Continued from page 171)

are in the top," he shouted, and Kelly leaped to hat feet to preform the task.

The gangue flowed out in an increasing stream, collecting in a depression in the sand Finally Thornton leaped to his feet, sensed a green willow stack be land prepared, and breach the clay stopper that pugged the hole below the cinder notch. The molten meta trickled through the cracked stopper, and he poked again. The bit of clay fell away, and a glowing stream of metal flowed forth. Thornton. watched at feverably. It flowed slowly down the track in the gand, the track last he had made to lead it to the crude meids. The numther head formed, and nowly couled. The secand hammer head furned and marted, mattering out of the hole.

"The mod was too wet in your mold," ex-

plained Parker, disparagingly.

The use and the adse glowed brightly, and slowly the bright light left them. Thorpton looked back and sow the last of the iron trickling slowly out of the bole in the base of the formers. In a moment it was followed by the ganger that now had sunk below the level of the emder putch.

WELL," said Thorston, taking a long breath. "That a done"

"Yes, scoffed Parker who luck stood by idly watefung all this. " But it remains to be seen what you have secured. It may be worthless, you know

Thorston did not reply but dug the hummer head out of the sand with bus stick

"I'll put it in the water," offered Kelly.
"No, no," objected Thorston. "I want to

are, if I can, what we have."

He took a stick and throat it into the hole that led through the hummer head. The wood flared up and he withdrew it, but presently he forced another in and the cast metal-rough and meschapen though it was was now a crude haminer. He drove the handle more firmly into place, and awang the laterer. beavily against a unnoth houlder

it chaged, and Thornton held its dented face up for Parket to examine. The deat coverd by the blow was poterable, even to a less cureful eye than Parker's, but he examined it closely. Obviously, he was improved

Now put it in the fire and heat it he ordered. * tiet it rea hot-

THORNTON built the flame about it and watched it used turned red once more

"Bring some water," ordered Parker, keenly interested zerw. Oomak shuffed off with a shallow back container by had made, bringing it back brumming full. Thornton watched the glowing metal, and finally drew it from the fire. He lifted it with two sticks and dropped it into the water. Steam rose in a great cloud. and the water booked. Slowly it died down, and Thorston upset the container on the ground The number head his atentic of on the sand-

Tev ri agn n. sawl Parket

Thoraton inserted another hundle and puring open more. His long was harder but the mark on the face of the metal was smaller. Parker looked at it carefully and laughed.

"What is it?" asked Thornton excetedly. "It's steel!" cred Parker, "Steel! Now

maybe we can-

Even the scotting Parker is carried away by this dramatic emergence of the castaways from the Stone Age to the Age of Steel. Can they, by their ingenuity, beat their way back to the modern age from which the murderous seal poscher, Kiska Joe, so rudely stratched them? Can they escape from this island of perti? Thrill open thrill awaits you in next month's installment of this amazing novel.





in P. Kornell ...
That is incorposed to a mass to depression of all against time for a mass to a few and a

IR 5

Audels Carpenture Guiden. (4 vals, 18.) Ex-plant how to forelly every letel of carpently job. 19-aide or countds work. Pictorus, phone carryle infrared diagrams backe any job race. New short cuts protern nide or covarida weeks, propose, prant, carrier on diagrams bushe any jederace. New alters dute posetticide acquisited. Builders and contractors questions answered. Here! Square and other produces a covarier. A practical full and fully rest bond for where represent ranging the methods of work that help you to be a leader.

Audete Plumbere Guides. (1 vols. 35.) stands of Guide explaining the theory and practice all plumbing, heating strangiliting, guefficing and short metal work. At the physical questions are not job. Clearly explains the new shortand short metal work. A taken super question any job. Centry arginalia the new size rules and so the new size rules and so the size rules and so the large size and home study course. Fully floatented, authors in up-to-face, with complete Signature Code.

MASONS COURS

Audels Mannes Guides. (4 vols. 88.) Every the stayer desirent Warters. Planters The first per ged Binne Mannes all find the answer to his excitent and reaching in that excite tracks information on all the latest and reactions referenced thinner covering the Mannes referenced thinner covering the Mannes Tracks helpiles pear iral settless of street construction.

Audola Handy Book of Electricity. (I vol. 14 h. A. to inite hathan to and hearly helper for every long. Worker, moretag Wirley Builds, Electric Long, Armatares, Maintenance, Melien, ils. leries A cample of State for I tertician. Anyther and Michell. There are to be a well as a better the for I tertician. Anyther and Michell I for the backs manifed in below. If I find lends a time to be feet a man be for the camp of the lends in the backs manifed in below. If I find lends a time to be the camp of the camp

Address Operation

The Secret of Successful

> LARTOONING Revealed/

Now you can least how the exceedable actualty of an ecomical priors.

A merica a rected actuals, called the ecomical priors are called the ecomical priors and can be considered. Art can be been by Beach Explains Everything, Luntains III. How and the Considered Everything. Luntains III. How and the Considered Everything.

Service and Legislery Burnt problems on the free open at \$15.00 of \$1.00 Years \$ **OUTLYNE PUBLISHING CO.** Filler M. Dogt. 96





The chairs of a Valle. Those Stage. Havelets Gutter Bords. Owing Children Bands. Under Gutter. Bunded on the Brands of the Bords. Owing the proof to our adjustment of the Brands of the Children of the Child

med ficeage, book, 318 Chicago, 1

Position-

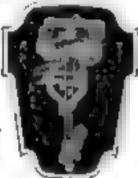
Fast and Slow Speeds Forward & Reverse

You can start your Caffe motor at the dock, and let it warm up. Then you can girle of feet or slow forward or back by merely taking or low-tring your sterring handle. \$37 ID puts this wonderful outboard motor on your hour the results every payments. Out full faces write today.

CAILLE MOTOR COMPANY 6740 Second Bivd., Dept. C. Derroit, Mich.

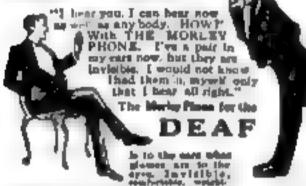
4 2 H.P.

SPEED
ONT 20 MILES METANOS
MASTER



SEND for FREE BOOK

DON'T SHOUT"



part from Write for bredding and particularies.

Well 1996 to Descript and particularies.

Well better to CO., Bage. 797. 10 S. Link Street. Palindrights.

CAMPERS AND TOURISTS:

There is the their thing for your reads to green the their chief in their green from the their chief in their green from the their chief in their green from the production of the thing of thing of the th

100 SCALE PLANS OF OLD and MODERN SHIPS



Easy to build and sell thip models. Stept 6 cents for calasses of over 100 plans, broks, prints, suspensed other Hunga that smeek of the res.

SEA ART'S GUILD

SEN ELEVENTH AVE. MILWAUERE WIS.

ARKOGRAF

Tughty Promy Track - Warren are factor and fa



Glenn Curtiss

(Bustabull from page \$4)

Government test flight in September, 1908. His name is perpetuated in the Government flyingground, Selfridge Field, at Mount Clemens, Michigan, near his native town.

"At Professor Bell's home." relates Mr Curtiss, "we discussed aviation from every possible—and impossible—angle. Each of us had his own idea. We had copies, now, of the Wright patent, showing how they controlled their plane against tipping over sideways by warping the wing structure. Of course, we could not use that, but we believed there were other ways of controlling the plane, which would not infringe on the Wright intents.

"We had full reports, too, of the experiments with glulers made by Octave Chanute and Israel Ludlow in this country and by the German, Lilienthal, who had been killed while trying to fly a glider from a mountainside. Some of us thought the hiplane was the thing. Professor Bell stock doggedly to his tetrahedral kite. We had some exciting discussions, but we were a harmonious group, and that included Mrs. Bell, who was extremely interested in what we were trying to do."

ON THE first of October Captain Tom Baltiwin was giving an exhibition flight with a dirigible at St. John, New Beunswick, and the whole party went down to see it. Then and there it was decided to form the Aerial Experiment transcention, which Mrs. Bell agreed to finance with an initial gift of \$24,000.

I have the original deaft of the articles of agreement of the A. B. A. before me as I write. In it Professor Bell agrees to give the benefit of his ideas and assistance in earrying out the ideas of Glenn Curtion, P. W. Baldwin, J. A. D. McCurdy and Lieutenant T. Selfridge, and they in turn agree to give Professor Bell the benefit of their advice and assistance in carrying out his own ideas of aerial locomotion, "and all working together individually and con-jointly in pursuance of their common arm, 'to get into the air,' by the construction of a practical aerodrome driven by its own motive power and currying a man.

The Association was to last for one year. Each incriber was to retain all rights in his individual inventions, developed "con-jointly." Professor Bell was to put his laboratory at Baudeck at the Association's disposal, which was to be the headquarters until January 1, 1908, when some place in the Luited States should be selected. And one of the members was to be appointed Director of Experiments. The document was duly signed by all in the presence of the Luited States Consul at St. John.

UNDER this agreement, Glena H. Curties was unanimously chosen as Director of Experiments and his workshop at Hammondsport, N. Y., as the United States headquarters of the Aerial Experiment Association. For a while the group continued (Continued on page 114)

today-The Dividing Line

between the antiquated and the modern home is automatic oil heat

YOU don't care what other people do, of course—but haven't you noticed that more and more of your friends are putting in oil heat? Haven't you noticed what a favorus topic of conversation it has become at bridge and distinct tables—and how enthusiantic women are about it?

Naturally it's the women who appreciate such improvements most, for they know—study too wall—the never ending drudgery of showling coal and salar; the inconventence and discomfort of constantly changing temperatures; the ravages of dust, soot and unote.

Of course, no woman really minds firing a furnece—when it can't be helped. But now that nearly all progressive people are putting in all heat—and now that a liberal budget plan has made the perfected NOROL so may to install—is there my valid reason why any than of moderne meure shouldn't enjoy this carefree luxurious, automatic oil heat; why his wife and home shouldn't be on the right side of "the dividing Unef"

The elimination of noise is only one of the many advantages offered by the new stient NOROL. New improvements with as nearly perject combustion as ungineers ever dared hope for, a degree of cleantiness paver drasmed of before, a total absence of soot, smoke or smell of oil; a remarkable low-cost operation—when lower than hard coal.

Whether your home is large or small, there's a NOROL of just the right capacity to give you the most efficient and economical heat, lee NOROL is made in eight different sizes. And it can be installed in a few hours time—right in your present heating plant, with practically no interruption of service. Mail the coupon for interesting bookest on of heat—free.



AUTOMATIC OIL HEATING FOR HOMES

FR	EE	_	N	₿	W	В	O	0	K
Dept,	NICAN W, 41st	Behv	bert	A'n	u, Cle	e L	HE	A.T	
Name						-			
City	-				5	iale			MP1.



Time to teach your unsuly hair its place!

Let's Go!

All day your bair will lie down now . . . Try this popular dressing - free

No matter where you go there's one thing you don't have to worry about,

And that's your bair.

Once it was straggly looking an hour after you combed it But today!—

From Maine to California, fellows now any -Stanon b Blacomb maters the wildest hair lie emoorthy in place all day long.

Let us send you. free a generous emple of this hair dressing—which more follows rely on than any other

Your heir never looks gummy with Bre comb. Nor dry and brills to certain with water makes it. Starowship actually brotherd —it helps to prevent dandeuf

fitacomb comes as a combing cream-in jury and ubee-and one in the popular new figure form as well. All drug stores.

OFFER

Renderd Leboratories Inc Dept BC 6, (IJ W. 18th Breet New York

Bent me free sample of Btucomb so thecked) New Squid form

Address



that furthed the many other fruit new of the wooderful Motor that furthed the world in 1926 by a remarkable speed and parenty. You will wan to know respectable about 1 he Patel,"

— a NEW device that steers your boat in any course you choose — straight or to well, without a restrict from any course your. Leaves you free to cast, or troil or rest. The New ...

BOAT (#) MOTOR Convenience and Dornber of but the fact of but the property of the property of

WRITE FOR FREE POLDER Just out — See how Lockward in blance the way by advanced engineering me hade backed by 13 years of manus copies building experience. (20)

OCKWOO 717 Jackson St. Jackson, Mich.

Glenn Curtiss

Fantinued from page 113)

to experiment at Baddeck with tetrahedral lotes and with aerial propellers on boats, and then Curtiss went back to Hammondsport to prepare for the conimpance of the experiment. He was "sold" on mechanical flight by this time, but was atill making dangeters.

Not long after Cuctoss return to Hammondsport, Augustus Post Secretary of the Aero Club of America, was in his office when a telegram came from Professor Hell "Start building of read "The boys will be down next week

"That was like Professor Bell smiles We haded de-Curtisa remanscently exhal what to build or how to build it but he wanted something built right away! Incidentably, he could not build anything himself. Unever new a man less handy with toots. The amplest operation, even driving a screw with a screw driver, stumped him. But he had very concrete aleas about the way he wanted things done and a wonderful way of getting his ideas across to the man who had the mechanical skill to carry them not He never 'bossed,' never scokled, never enticised, but somehow he kept other people on their toes all the time. He was a wonderful man."

YONTEMPLATING the telegram from C Professor Bell and discussing it with Mr. Post, Glenn Curtim decided that the way to get quick action was to build a glader, which could be constructed in a week and would provide occupation while the motor-derven plane was being built So when McCurdy, "Casey Baldwin and Lieutenant Selfridge joined him there was a glader all ready, and all four of them practiced gliding from the fulludes of Lake Keuka.

Selfralge was hoven the honor of approving the first plane. It was a hiplane, with the wing structure covered with red silk, so it was named the Red Il rag. Each member of the Association contributed ideas, but this was to be Selfridge's machine, and acceptance or rejection of the suggestions of the others rested solely with him. The Red Hingwas finished, motor metalled, everything ready for the "jump-off" early in 1908. but the icy north winds did not let up sufficiently to make the experiment until March 12th when, on a still but intensely cold day, the Red II mg made its first and last flight.

THAD been agreed to try it out on the I first favorable day, whether Selfridge was there or not. When the day arrived, Setfridge had been called away on business, so it fell to "Casey" Baldwin to take the tiller, while the others started the engine by giving the propeller a whiel.

"There was a real thrill," and Curt es, "The Red Il'ing was equipped with skids, as were the early Wright machines. It skated over the ice of Lake Kenka while we beld our breaths, wondering if it would rise into the air. At last it did! We saw an arrplane fly!"

The Red Wing rose nearly eight feet

into the air, traveled a distance of three hundred and eighteen feet, eleven inches, and then crashed, landing on one wing tip and wrecking the whole machine.

"It was about what we had expected," said Mr. Curtiss, "but we were juliant. We knew now that we could hold another machine that would fly higher and longer We had spent seven weeks building the Red Hing and it had taken twenty musutes to smash it, but we had achieved a great thing -the first public flight of m heavier-than-air flying machine

"CASEY" Baldwin took charge of the → design of the next machine, the White. ling. The ice had broken up before it was burshed, and its tests had to be made on an old race track near Hammondaport known as "Stony Brook Farm." There were crashes and disappointments galore, some short jumps, one or two flights almost as high and as far as the Red H'eng had gone, rebuilding, repairing, changing the design, consulting with Professor Bell, who had come down from Neva Scotta to join his youngsters, and a tremendous disappointment when, after discarding the expensive silk for cheaper cotton for the wing covering, the machine refused to rise at all. This was puzzling, until Professor Bell pointed out that the porous cotton did not offer sufficient sir reastance; so the wing covering was varnished, now the universal practice. On May 22, 1908, Glenn Curtus took his seat in the II hite H'reg and really flew?

One thousand and seventeen feet in nineteen seconds was the White Wing's record on this occasion. It rose high enough into the air to leave no doubt that it was really fixing, high enough for the people of Hammondaport to see it over the race track fences. And it landed in a plowed field without damage.

"This was regarded as a remarkable flight and, naturally, I felt very much elated," said Mr. Curtiss, "There was no question, now, that we had found the right principle on which to been our further experiments. And we had proved to a skeptical world that mechanical flight was an actuality."

Now it became Curtiss' turn to take charge of the construction of the next nuchine, and work was started on the June Bug, in which Glenn Curtiss was to make, on the Fourth of July, the first previously-announced public flight ever made by any airman, and to win the Scientific American Teophy for the first flight of one kilometer or more.

in the next installment of this remarkable series, Mr. Stockbridge tells how Glenn Curties built and flew the June Bug, won the Scientific American. Trophy, gave New York City its first sight of an airpiane in flight and then went to France and captured new honors. This story is more than a chronicle of the career of one man; it reveals for the first time the fascinating details of the early history of aviation facts bitherto known only to Curtina and a few other pioneers.



My Contract/ To Men Who Want New Hair

Why fear dandruff and falling hair—when you can easily escape the tragedy of baldness? Here's my contract to you in black and white! I positively GUARANTEE to end dandruff -stop falling hair-grow new hair in 30 days-or I'll pay every penny of cost myself!

By ALOIS MERKE

Founder of Famous Marke Institute, Fifth Ave., New York

NOW you can stop falling hair! Now you can save yourself from buildness! Now you can try this no rank way to grow new hair in 30 days!

Read My Contract:

No strings attached! No "lfs," "Ands," No matter how thin "Huts" or Maybes. your hair may be no matter how last it is inlang out—no matter how many treatments

you've tried without real resulis - my contract stands. New hair in 30 days - or the trial coats you shootstely VOTILING!

My Secret Method!

There's nothing 'tracky' about my treatment, It's simply the result of years of research and day after day experience in treating thousands of cases of loss of bair At the famous Merke Inst. lute, Fifth Avenue, New York, I have proved that in most cases of bandness the hair roots are not dead but merely dor mant - asto pl

Thus you are foolishly throwing away money-wasting your time—when you try to reach these dormant roots with ordinary hair tonics, oils,

massages and salves. Such measures treat only the surface ston and never even get to the roots, the real source of trouble. How could they ever possibly grow new hair?

How My Method Works

It's no use trying to make a tree grow by tubbing "growing fluid" on the bark. You man' get to the rootal

> and that's just why my scientific treatment is so tremendously beneficial! It penetrates below the surface of the scalp. It quickly reaches the cause of the trouble—the dormant, starving hair roots It awakens them. It carries nourishment to them. ficial hair tonics—no rubbing. Net in a surprisingly short tune sooner than you ever magineti possible— vou have a wonderful new healthy growth of hair-OR I PAY ALL LOSTS OF THE TREAT MENT MASELF!

> And, best of all, my system is so sample that it can be used to any home where there is electricity without the slightest discomfort, and for mil a fess cents a day.

New Hair or No Cost!

Thousands claum seeming muracles for my treatment. I don't I admit some cases of haldness are hopetess. Only remember this these cases are so rare, and so many others have regamed luxuraant hair through my method that I am w ding to let you try it for 30 days-AT MY RESKI

Then if you are not absolutely delighted—say so. And I'll mail you a check immediately—redunding every cent of your meany—and the treatment will have cost you

Send for Free Booklet!

Lack of space prevents one from giving you all the lack a about this amaging treatment and the winderful contract and absolute guarantee I offer you. If you will samply super and mall the coupum below I'll and you—absolutely free—a remarkably interesting tookiet telling to detail the whole story about the remarkable system which is growing new hair for thousands all over the couplity. In addition it to be all about my frontial ontract which enables you to take the treatment without a penny's risk. No obligation. Sign and mail the cooper Not it. A bed Merks Institutes, Inc., Dept. 174, 512 high Avenue New York City ***********

ALLIED MERKE INSTITUTES, Inc., Dept. 174, 512 Pitth Ampion, New York City.

Please send me without cost or obligation to plain. wrapper a copy of your work. The New Way to Grow Hair describing the Merke System.

Name

State whether Mr. Mrs. or Miss.

Address.

. Stutet

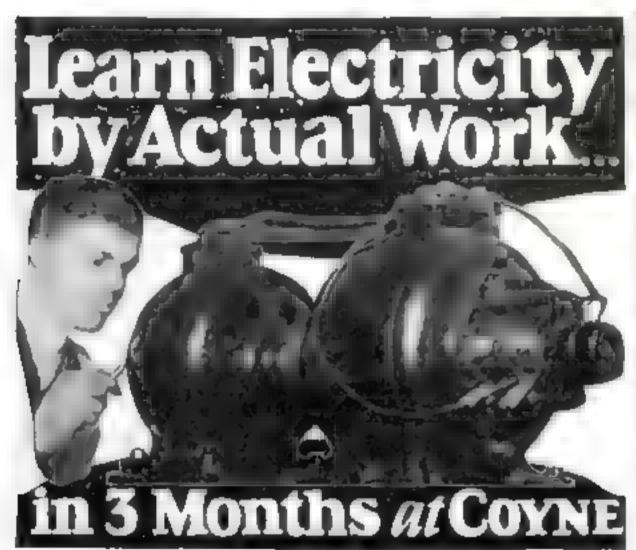
PROOFI New Life and Lautre After 8 Days

A chost time ago my hair was fall ag out and I was trespled with dandmin w suderfie treatment. Tair ha dul my wap to a very hearthy can can stopped the half from failure out and given it new ife and a tre only though it eight days. R. A. H. Ame Look

Treatment Quickly Puta Scalp in Good Condition

I have been partly held for years and my hair was to tich godo riva. I lietieve I was life have been completely but me my har stoped far one and now my wally to so a healthy condition and new base his examed to grow C. L.L. Brace Wat

Money Making Opportunities for Resders of Four Science Mondaly



Learn to Earn \$65 to \$200 a Week

Or Go In Business for Yourself and Make \$3,500 to \$15,000 a Year

Yes, 3 months at the Great School of Coyne, located in Chicago, The Electrical Center of the World, will make you an Electrical Expert capable of commanding big pay. The whole world of electricity is open to the practical man, the man who has had actual experience with electrical apparatus. Coyne gives you a practical training on the greatest outlay of electrical apparatus of any institution in the World; everything from door bells to power plants.

Not a Correspondence School

We don't make you a mere "paper" electrician. We train you by practice on our mammath outlay of setual equipment. We train you in house-wiring by having you do it exactly as it is done outside—not just by reading about it. The same applies to armsture winding, power plant operating, motor installations, sutomotive work and hundreds of electrical jobs. That's why we can trum you to become a Master Electrical Expert.

No Books—No Lessons—No Classes You Do Actual Work

The Coyne practical course includes no books, printed lessons or useless theory. We train you to work with your head and hands on the same kind of electrical apparatus as you will find "out in the field." Age, lack of experience or education is no

drawback. Our students range from 16 to 60 years of age. Covne gives you Free, a lafe Scholarship which enables you to return at any time for instruction on new apparatus which we are continually adding to our course. We assist you to a position after graduation. Free Radio Course included.

Earn While You Learn!

We help students to secure jobs to earn a good part of their living expenses while studying

Send Coupon Now

Send coupon today for big Free Book and full details of our special offer of Free Radrood Fare. Act unw

COYNE

ELECTRICAL SCHOOL 1300-1310 West Harrison St., Dept. 47-73 CHICAGO ILL.



IN AUTO ATTEMPT AND

H. C. Lewis, Pres.

COYNE ELECTRICAL SCHOOL, Dept. 47-71, Lies-1316 W. Harrison St., Chicago, 10.

Dear Mr Lewis: Please send me free your big catalog and your special offer of tree mitroed tare.

Address

How Robert Hubbard Is Getting Ahead in the World

Every month hundreds of people tell us how they have used advertisements in Popular Science Monenty as stepping stones to success. This month Robert Hubbard wins the first prize for the best letter telling how success has been won through the use of opportunities offered by advertisers in Popular Science Monenty. Mr. Hubbard says:

Contest Editor

The advertuement that interests use most in the "Money Making Opportunities" section of Portura Science M. Strike for January is that of the American School

Two years ago I was working in a big department store at \$18 a week with little hope of promotion. The oldest and best sales people on the same floor with me received \$25 a week.

For two years I studied hard at night and finished my course in business training which included the art of writing advertuements for big businesses. I am now doing the advertuing of two of the biggest department stores in the city. My salary runs from 800 to \$125 a week and I am not closely coefficied.

My advancement with big boost in earning capacity are due to my auchitson and the training given me by the American School.

Courses are offered in electricity, drafting, automobile mechanics, business and high school brunches, and any young man or woman who deares to rise above his environment can find what he needs in the American School.

ROBERT H. BRAND, Little Rock, Ark.

From \$18 a week to \$80 is the story told by E. J. Bennett whose letter wins the second prize.

Contest Editor

I always had a talent for drawing and wanted to be a commercial artist, but there were seven other children in the family and money was scarce. However, I managed to finish high school by selling papers.

As I had to work. I took the first job offered me, a place in a grocery at \$18.00 per week. A long ways from a commercial artist wasta to? But I hadn't given up hope. One may, some literature from Meyer Both Company fell into my hands. I read it engerly and sent for more about the work I was interested in. I enrolled as a student. It took me nearly two years to finish the course as I kept my grocery job but, I carned, by my drawings during the rourse, enough to pay for it seven times. Today I'm making over \$4,000 per year and I have not reached my limit yet by any means. It is any wonder I in a Meyer Both "hooster"?

E. J. Bennere, Parkersburg, W. Va.

You will see in reading these letters that both Mr Hubbard and Mr. Bennett not only have greatly increased their salary but they are doing the work they most want to do.

You will find on pages 116 to 143 an opportunity to study any business, trade or profession you may have a natural liking for. Decide (Continued on page 117)

How Robert Hubbard Is Getting Ahead in the World

(volunted from page 11d)

what you would like most to do and then send the coupons or write to the advertisers in the Money Making Opportunities Section who can help fit you for the job you want.

\$25 in

CASH PRIZES

For the best letter of 170 words or less answering the question—

"What advertisement in the 'Money Making Opportunities Section' interests you most-and why?"

we will pay on May 10th the following--

CASH PRIZES

First Prize	\$10.60
Second Prize	5.00
Third Prize	3.00
Seven Prizes	
of \$1.00 Each	7.00

First read every advertisement in the Money Making Opportunities Section on pages 116 to 143. Pick out the one that interests you most and then write a letter-not exceeding 170 words telling us why you find the advertisement you have rejected the most interesting.

Entries for the contest will close on April 1st. The prize winners and their letters will be published in the June have of POPULAR SCIENCE MONTHLY.

Address your letter to Contest Editor MONEY MAKING OPPORTUNITIES POPULAR SCIENCE MONTHLY 250 Fourth Ave., New York

PRIZE WINNERS

in the February Contest

PINST PRIZE \$10.00. Robert Hubbard, Little Rock, Ark. American School

SECOND PRIZE \$5.00

B. J. Bennett Parkersburg, W Va. Meyer Both Company)

THIRD PRIZE GLAS

E. O. Greene, Gallipolis, Ohio International Corres, Schools)

PRIZE WINNERS who receive \$1.00 to east entire of Harrist Paine, California, Pa. (David B. Clarkson Co.)

Meivin L. Hopis, Reyport, N. J. Natural School of Cartuming)

T W Davey, North Vencouver, B. C., Canada. (Brooks Boart Co.

D. C. Marshell, Manhatton, Kannin Aero Shop

Oliver O. Fuller, Lincoln, III. (North American Institute Frank G. Davis, Springfield, Chin David B. Claritson Co. Imbel Ebel, Birocktyn, N. Y. Fireside Industries.

J. A. STRANSKY MFG. CO., Dept. D-736.



Here's My Guarantee to Car Owners...



Save 4 to /2 F Gason

Or This Daring Trial is FREE

Hereby Hurl This Challenge at Every Car Owner in the World. Accept My Offer To Test This Amazing Device on Your Car-The Test To Be Pree if Unsuccessful in Your Opinion. Read Below How It Works. Learn How You Can Make Money Full or Spare Time as My Representative. Then Mail Coupon Before Offer Expires. Many Earn

OW would you like to HOW would you like to run your ear 1,300 mues without having any passiline at all? That is what J. R. Wood, of St. Louis, reports. "My Oldsmobile sedan used to average only 17 miles per gallon," he writes, but since instaling the Stransky happrises it has averaged better than 30 miles per gallon for over 3,000 miles."

More evidence. Out of thousands of unsolicited testimonials we have reports of Ford 20 to 60 miles on a gallon, Star 25 to 31, Chevrolet 30 to 52, Dodge 20 to 40, Hudean 19 to 21, Overland 19 to 31, Nach 18 to 32, Hupmobile 32 to 37, Buck 17 to 32, Studebaker 23 to 27, Cadulac 12 to 18—and so on. The last is endless.

And still more oridence! Out of the overa-milion users, we have many reports from those who have had the Stransky Vaportser. on their care for as long as three to cusht years Every day they give it the most searching tent in actual operation. And stil they continue to report mereared mileage, more power, less carbon and engine trouzile.

How It Works

J. A. Stranelry, former enadidate for Covernor of South Dakota, is the inventor of this animalia device It is a sumple fittle passe of metal and much la ger than a dedat can beyondy can be all to a few minutes. It is automatic and self-regulating it

The STRANSKY

Saves Gasoline

Manageres Over \$500,000

Palconna, So. Dale. Extablished 10 Years



the a sir power of the grand ne (Hiera) takin hose shows that these of recent wants 20 to 25

if their gas the much amproper come binetion. But if your mening is loss there 25%, you need not pay a red cent for the device.

Ends Carbon Troubles

But coving gas lan't the only service performed by That earlies mercedies to car owners. They say it has readed earlies and spark plus froubles. There is it has readed earlies and spark plus froubles. There is there and spark and sparked earlies a third service at entering the power. And it pushings a total earlies at the carries at entering the tentering to the earlies method used in cleaning our the famous Dissel majors.

How This Test Is FREE

Ding't send a promy of accept anything until you ad out how this device works. The reupon below find out how this device works! The reupon below will being you full details that ensure twey quantiest this opportunity to cut down the superson of

Fuhrane your en-

If you are attenued o probable movey in the side or as a full-time of due to the we have a a mderfa plan a you. Over a 1000 mer have bethere districted so for priced device Aust Vest they make piece and an No setona etbetienne is segui to the anaposts now with agt obugation

in 3 O Hours

My gas bill has been The game of the company of the control of the contr datates I most out ытфега

A A Williams.

J. A Stransky Mig. Co.
Dept. D. 730 Pakwana South Behate
Yes, I want a learn full details of year ofter to
there his was 1 as a me gasuline and raction
to solder and correcte power 5 to send me details
of or money marking dash for distributors. This
request does not obligate be in any way

Address

CHI

Finte

1 7 3 45 5 W. C

Quiek Action Advertising

Adverticing Services

A SERVE OF A SERVE SPECIAL SERVERS OF A SERV Ask volta. Fr a cope of the standard of the st Principle

Property of the Till by the installing posts from the property of the Till by the installing posts from provident. te ten take

Authors and Manuscripts

\$ 6 0 5' H. Stean Phot to Photo or and emissions. description plant no recording to all description angular the me taken descript Manager de the even top to the most all

may I may at once with first persons with Man Delivers of a real of the first terms. I see a War and Witte Ambrica Thomas

I A a h ? a mg pusme Casper Nathan, John Ru.

Fit 3 many Western Coulde Told-1234 Fire Com-

to H & STEET HE MADE COMES for a copy of the major of a copy of the major of the ma

Automobites and Accessories

It's LIV IN to then for I only he also T it happing with

The state of the s

offriction.

THE American School of 4 a se announces a separate of a technic A the right wine of a providing on completes. American for not of A to some House 4741 1991 Michigago Arm.

Chicago Minimum

In the me of the first and properties good not also of the first and properties good not also of the first and the first and

Bending Machines

Till picks him it morphis Westerbries I at proad time the property of the book and as himse Perring being Prome and I have been been at the state at the black Rename by the property of the p to more Man

Blackmark

P.E. A Military Stanffilled bibles souls to stay the party is red.

Military Major Stanffilled to the Stanffilled Stanffilled

Boats and Launches

a NINE of the build may seem book for this "His 2 th de in an at a

Burmers Opportunities

TEAR he either and to be prog and recommended No total Afterior & Association Science & whiting News

the thing has a result of the tree-free area. In the case of the c

W.F. N. mark. may the boar series for interesting do not having. On plant wombons outspace? No may 3 or 5 is worth open of tog Paglathale. 4 caps. No may be followed to Aleh dant merhen odisent. Zi ige af ing Pagertale Car har is en dan 6 Mich alast worthern of species in me. 3 or 5 or 5 open of the Programming of raps of the state of the Community than a cross with the community than a cross of the cross of the Community than a cross of the cross of th

Ranse 30 Cents a Word. A 10% discount is allowed on all constructs for six consecutive insurtions. Advertuements extended for the June, 1917 years should be received by April 5th,

Business Opportunities

PATENTH procured: Trade Marks Registered—A sumprehensive, experienced, prompt service for the pro-tertion and descriptored of your ideas. Preliminary educate gladly furnished without charge fundies of in-

he had not been he with the head of the server of request he had been he with the head of the server of the head o where the second is the second of the second

Property of the state of the st

of the testing markets that Ch. Here

by a report of a series of the series of the

of Country of and and one may the or by the old d had a

the thing of the the state of t

to see many of the artists the rate haid on reparty and later A a see or and at a great behavior
to a a hard A and the a seem to be a

the a a base of a base of the a section brought I late
the a a base of the artists below the artists of the
the and the set of the artists below the artists below the
the artists and the artists below the artists below the
the artists and the artists below the artists below the artists and the artists and the artists and the artists and the artists are artists and the artists and the artists are artists are artists and the artists are ar

Same the conference of Lamp contained Lampto per

3. 1914) St. Steph work he lames sent a home I create por a principal and to the go a real and another he had been a find another he had been appeared to the principal and the sent and th

ad dwaring I r shore and are but for her normal high So di hay an electric bitton, with the file of the state of the

The state of the s

It is a set in the set of distant his by of many from any tall is and set of the set of the tall it as from the first from the set of the set o

FIRE I they as in Nurhams Large profits off to his To be read Holling Company

I is and a special constraint of the constraint

Plac Pratt

To Till trans who we are to me to not attend and from the To Till's reason to the sea of more thinds and passed from the second or in the second of the second

Capital Rassing

CAPTAL S police for the s. Fe per s. campe tion that the fall has reflect in a resident and und income formed, sally defen, all fireadway have York

Capital Rairing

IN A STAR 2 STYRETS ALA Seeding Capital Will have a major to up - 5 h and 8 imports more pre-tricts. Talendage C'22 North Hactor Ave.

to a Return on patent Propored Commission at A write Ad writing Agency 2000 Warran St. Parel 4

Chalk Talks

for the product of program is to a prolong free

Direction Smokers - Cigareties

fine of et al antique his natural and happy the fine of the state of t

Dogs, Bods, Fish

Re a Tell row word traft purpo, \$15 feelbings, 50).

Dupicating Devices

Printed PT 11 / P1 t 1 H to 10 o

Education and Instruction

Harry 10 % I restroy poid emergines to the same point of the same

her any car is any property of the property of the selection of the select

pl Sall or to an easy high branche factorine. Propagation of the first of the factorine of A control of the property of t

Electrical

Titl filter to use a Westing Marrian, his fr F. Barran place 2 h. for given all a surface spring parties 2 h. for given all a surface spring a province 4g for many for many for the parties of the surface spring a province 2 h. for the parties of the surface spring a h. for the surface spring a h. for the surface spring a surface spring a surface parties of the surface parties of the

Financing and Investments

No. 1 to the security of the security of the security for a copy of the

which is the second of the follow. I could be some tensity important there which will prove interesting and valuable to you. It also tells "line I not fine I not line in the Science Woodship Provide this?" You'd like to be a supply to Alanager, the De Alanager in a supply to Alanager. to march I se Address his Annual Pro-

For Boys

1.5 m de 190 m) thouse or criteria and 150 feet meets film not acquist to choose I beautes Mappin Desirch, To the composited.

For Men and Women

DETECTIVE to We become or or of I species of the forest to the forest to

Tatted a new Popular accesses Monthly, 150 Fearth ave Now Lori.

What Spell Does This Strange Book cast over its readers?

Examine it free for 5 days. If it does not give color, charm and magnetism to your personality, return it within the 5-day period—and the examination will have cost you nothing.

YOU have had books that entertained you—books that interested you—books, even, that amazed you. But never a book like this!

Here is a book that seems to cast a spell over every person who turns its

Dirlikea

Almost every page radiates brilliant ideas. Every paragraph guides you unerringly in developing a new, dominant, powerful, magnetic personality

A copy of this singular book was left lying on a hotel table for a few weeks. Nearly 400 people saw the book—read a few pages—and then semi for a copy.

In another case a physician placed a copy on the table in his waiting room. More than 200 of his patients saw the book—read part of it—and then ordered copies for themselves.

You can sway and control others' You can command success. You can influence people to do things you want them to do. This strange magnetic book shows how!

Once for the Wealthy Only -Now Within the Reach of All!

"Instantaneous Personal Magnet-

What Grateful

Readers Say

I am indebted to Shaftrakery for all than I am in this world."

Made me a sacre-s fin actually socially so-

I would not give up

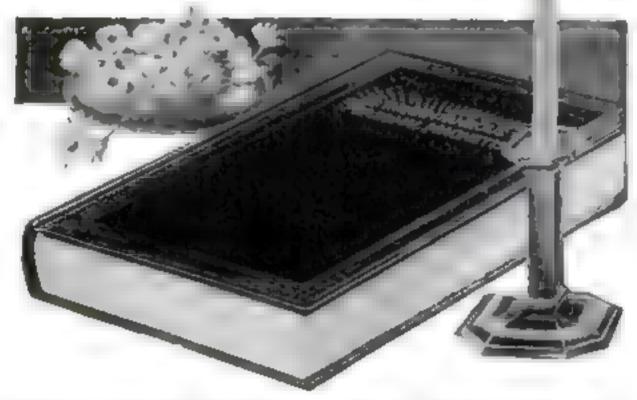
taught me for \$100,000

ism," just completed after fifty years of research and study, is now off the press and ready for you. Edmund Shafteshury, founder of this interesting system, devoted a lifetime to it. Such men and women as Queen Victoria, Cardinal Gibbons, Lord Beaconsfield, Gladstone Henry Ward Beecher were among his friends and pupils.

"Instantaneous Personal Magnetism tells how to draw people to you at once, irresistibly—how to be popular everywhere, in any society—how to be a magnet of human attraction, popular and well-liked wherever you got

It not only tells exactly how to accomplish these things—it tells how to accomplish many of them without delay—instantly! How to develop your mental, passional and personal magnetism!

Shaftesbury's amusing ecience of magnetic



control was at first confined to the use of those wealthy few who could pay from \$200.00 to \$500.00 for the accentate arrivate instruction.

S500.00 for the scientar's private instruction.

With the publication of "Instantaneous Personal Magnetism," Shallesbury's complete method of magnetic development is within the reach of everyoos. Everything that he taught on the cultivation of personal magnetism is in this one authentic book. It will show you how to awaken your creative energies and set free your great thought force and magnetic self."

What Personal Magnetism Is

Personal Magnetism is not necessarily inborn. It can be cultivated, fostered, until it becomes a natural part of you. Your eyes,

hands, lips, voice, bearing—all radiate personality of an individual kind. All lend them selves to the one great fundamental quality known as Personal Magnetism.

Strange Effect on Readers

Readers of this book quickly become masters of a singular power to attract others to influence men and women

around them. Not by force—not by loud argument. But rather by some subtle, insuranting power that sways men's minds and emotions. They are able to play on people's feelings just us a skilled violinist plays upon a violin.

Folks are rurely the same after reading this book. Their manner changes. The tone of their voice, the expression in their eyes—yes, even their actual features seem to change—seem to grow more cultured, more remed.

Release this dormant magnetism within you

 and watch yourself become more and more successful, popular

cave verve, color, magnetism to your personality—and see what a difference it makes in your life! The drab, coloriest personality is a handkap; the irresistible, dynamic, compelling personality cannot fail to be recognized and respected in every society and under all circomstances—in your business, your profession.

Instantaneous Personal Magnetism — Now Yours!

The principles that Estimated Shafterbury taught to these farmers men and women—and for which many paid as bigh as \$500- have been brought up to date and the new revised outside out new as youts—for if the more than the rost of an entimaty volume. Imagine it followed Shafterbury's whole automatent of neighb of mannets control or apply to you, we personally and use a your dely compare with people.

Mail Coupon Today For 5 Days' FREE PROOF

Is you want a compelling personnicly if you want in unset sin, new power or a strong it send for an a niamenus. Personal Magne son at once Mail do coupou today their remarkable volume, bound in hand-some dark cloth and gots, embrased, will be next to you at once for a 5 days' FREE examination.

If you are not division and amputed by this amazing

If you are not duritled and assured by this amazing book, just return it within the fields period, and the associations will have cost you nothing. Otherwise keep it as your own and said only \$3 in full payment. Clip and said this coupen. NOW before you forget for the roots magnetic book you ever sow! Rainton University Press shopt 14 H. Menden Coon.

RALSTON UNIVERSITY PRESS, Dept. 14-H, Meridan, Conn.

You may send me "Instantaneous Personal Magnetm for a S-days free examination in my own hung. I will be the judge. Within the S-day period I will eather result the special low price of \$3 in full payment or retarn it without cost or obligation.

Nume

Address

City State.

Formulas

500 FORMS'T as 20c. Catalog Free, Ideal Book Shop Park Ridge, Hitames

Bithanelle 92 Mustle 86 Manetanter, N. H. Ang

SRIN PARTICL LANGUA Semada. Non And Original Competer Sulgeria Private Compete Formula (10 0) Sample on Lith to pert flore and level. \$1.50 Pagene Suy Committing Chemist 7 Millioge St. Reverbill, Nines

For Inventors

UNPOTESTED tolers has be sold I off you have und being you make the san liver go to make the san liver go to make the san liver go to make the san the property with write W T toleron, not less on livering. Wholeston, it of the toleron to the latest of the Lorent be.

Ecula, No

Louis, No. 1. No

propagation of the designed distinctions accepted at the propagation of the propagation o

Especially and another the property of a security for and a Beginning particle amount which is not a particle and the security of the security

For Sale

TATIVE We supplied the free free teachifesturer filled and considere free Walters. 353 Passaum, the high

to it that F. Patent for I start Was as not hereare consisted, improved blomp 4 flar, the right of Regulty Rock. Herry Antonions Tonnes, Alsoha

For the Home

Here I water on cap. 46. Afghe your own Addisonable Welse Junt Release Man a dec Manjer will (1918). Set als it clears on he hadde build one on a major friends. Seek works as it clear to be able to be removed as the day for the removed as it clears to the for the formal buildings. Morbin The had no had to be a treasure. Then The grant had a treasure, then The major Morbin The follows given and his problem the law of the rest arthur of treath to the law to the following the following the few of the first bounds. An indicate the few of the first bounds of the first bounds of the few of the first bounds of the few of the first bounds of the first b

Help Wanted

FARN 625 Workly space Fines, will intellige news-papers, magazines, 6 specience universality. Describe tree Press of office 6, 15: 5 Fall 5 Mag.

WANTED Representatives in many including in he Poster Nearth Popular neuron Mantaly 250 Fourth A - New York

A F New York

SETS A fed at constrains have one or right 6 and pay

Experience unnecessary, det of positions from that

2.5 & Majors between N Y

E. I VERN M. Through Presch plots, Facely improved

Interest profit a Place from West Marton Works.

Facelying for the Majors West Marton Works.

Facilities for the Min
19. 1 NTS 1 printiple appropriate by Dond Normaharquing and alread sold hyperment of Dond Normaharquing and alread sold hyperment of Dondon Sold Street

20. 120, here delivers 1.4

211 New Jeron 1.4

221 New Jeron 224 New Anna 112 Dec et 1.50

222 New Anna 224 New Anna 112 Dec et 1.50

223 New Anna 224 New Anna 112 Dec et 1.50

224 New Anna 224 New Anna 112 Dec et 1.50

224 New Anna 224 New Anna 112 Dec et 1.50

225 New Anna 224 New Anna 112 Dec et 1.50

225 New Anna 225 New Anna 112 Dec et 1.50

225 New Anna 225 New Anna 112 Dec et 1.50

225 New Anna 225 New Anna 112 Dec et 1.50

225 New Anna 225 New Anna 112 Dec et 1.50

225 Dec e

The Nation 225 Mexican like Dies of Lydn 115 N and C N Mail or Former Recipe who \$225-1225 (position) where y account or unrecessors against free Y Realford: 2 Berne areas 12.5 Server No. 115 Fig. 1 to 12.5 Server No. 2 Fig. 2

Help Wanted Instruction

1 ETECTIVES Form Rig Money. Excellent opportunity. Transf. For the 1 work, Experience the measure of 2 will be then go in again former. Concrement Detroit of 2 will be then go in Engagement (with a or better offended). The property offended in the property of the proper

MEN wenture forms, comme, culturer until chert and other got? postrions. Write for particulars, Mohans, A 10 I sen er, 4 No.

WANTED Representations to every factory in the United States Popular Science Monthly 230 Fourth

t 8 is TERRITOR forks \$05 to \$225 month blen women is up Steady were late post of the Black to the post of the pos

How to Entertown

PTAY's matrial consider and review, marked must blackface kits and the set monology dualings revisitions, external metals must be able to save a terminal problem. The beddhooks, make a goods bug relating free T is Decision & Co. S., So Wahar, hept of h. again.

Incorporations

Diright title I or to you the term for thank been thank the control trange of Wilmington, trange of the Unique too.

Information

Stylight Neoglic This and all ett Erger hat provenses Provid at rate eer de. Larges meddense formatoutdense in 1981. Alan 1988. But 1882. Last Adaption 4 white

the Appendix A. The party of the start of district A. The party of the spatch A. The party of the start of th

Insects Wanted

Wild Not repend or the senson of half matters of testinerally make a "I had not a fact his state to cold feet as a factor of the state to cold feet as a factor of the state o

Instruments

TENTIME to the era the edge of a ready experiment to be from the stare. You can do the easier thoughtness as the total new or erast activities in the base the experiment of the one or time attack introduction of a continue to the base of a continue to the continue to the experiment of a continue to the first track of a continue to the first track of a continue of the first track of a continue of the first track of the continue of the first track of the continue of the first track of the first track of the continue of the first track of the

Inventions Wanted

Will, her approved in sortion. Write W. L. Keutig, 616 N. Discontinum of a case of the

155 to 5 130 to 5 decays of the Parameter of the parameter of the State of the Stat

VEHNON BAKER For Advertising "

Laboratory and Chemical Services

FORMIT, and The tree Chemical Petence can de-vise American Deligible Poor on the liber blading Bongs Buy Banch of Valuable Life attraction to Lists Don't buy Like you receive that, there at Analysis, Charges recompile. De Lighton bladies, Chemist Tamps Period

to it the real production makes and working formula in processed in tracked to the Winter Lab W. Stories and M. PAPER NET THE A COMPANY AND A STATE FROM STATE PARENTS AND APPRENT OF A STATE PARENTS AND APPRENT AND APPRENT AND A STATE PARENTS AND A STATE PARENTS

Languages

WORLD DONE where Markets, 1000 beginging Princers, \$1 of Arabit Chicago, French Compan, its an Japanese, Research South of Angelore Publishing Company & West 40th Miles New York

Letter Specialists

TENOX BAKER, See "Advertising "

Machines

INCRETE Bubling Plant Markings and Maids, analog time Constrate Magnifestating Unit, 5 N. Main, St. Land, Ma.

Magne Tricks

his a magician, stree shows extra these side Cooks Macrosl 4 a 15 pt 5 in the books

The Oaks Marriel of Dept. And the bounds Mar.

Builder, Marriel Mesternee, Mar. Linear A relation.
Catalogue Pres. So ref. ata, Ha e eta Missenhord.

ANALL, and Mar. By pour the eta. New Property.

ANALL, and Mar. By pour the eta. New Property.

Six for the Laborater of the Property of the Designee,

Six for the Laborater of the Laborater of a copy of the Property of the Catalogue Adoptivity of the Market Martin, 250

1 and Assential New York.

1 A ACC 1988 A boundary for the Property Catalogue.

7 A IC torsky house, garness for other Cutalog or Makary 11-239 Mount out of Philadenth, Pa. a SED tricks, on tricks Rybrid etc. Ven of and Am. 64 page books demokre galder the each beaner 166 a Jefferson, county life has

Mailing Luts

1918 Or ARANTEED Matting Lists Agents, State-1988 F. ma, Radiciduals of Essaying for ever need Charanteed milable and networkel compiled. Casas gur and prine has on request 5 \$45 fire and St. Newholk St 4 National Mulling List Co.

Mail Order Business

VERNON BAKER, See Advertidar,"

Mail Order Methods

MAII. dealers, \$1.00 brings invaluable book. Save or by knowing how Fodra, 7963-5 kingston, Charago.

Manufacturing

MODEL, Experimental and Light Machine Work Accurs a prompt ser on Lawest prices. Southern the rames of Pallan Ave. Stouten, Trans.

Miscellaneous

POREVIS a cast fond collines, tedians, Marson, Trappers A organ, I block to send for at little total states again flowing to sell or rate flood "and St. Introduction, N.Y.

Models and Model Supplier

RPECIAL marking purphers conducted distributes a larger of a newlest product of a test of all blacks. Deep J. Constit. I array are distributed at the form the form and the array of the larger of the form of the same the larger of the larger

The Arthur 1984 It is a pure the Tools Month of the June Mitchell grant about generally Marie to the June 1984 It is the Pieros Mitchell Mitchell Control of the Park It

described to loop up or all \$5.00 Let model 6 loga-The property of the property o

that out the grades out 12 auture prepared from that out the grades and engineering department and 27 years experience saids to a wife, but it review 1 award prices. Holmater him, Co., 2000 E. Bith St., Cleveland,

W. H. 16 for Models Serial Work and John ing Front

I self a control decision through the fall entitles to the process of the process

Motion Picture Business

TOTE The left 140 ft of foods \$1 ft up it mud-bridge accordes and fast. A feature Company, Box A1508, New Its on 100

Motor Bargams

The CTS for 1 & 51 \$ G. 1 in val. A C motors at a pulses of y \$14 \$0 each Also 3 C motors in stack lideal for all which power purposes. Tempor as a set of C \$2 Northern Then we Supply to a Duistin, it is, Then in

Motors, Engines and Machinery

Marticles New old 110 or 220 with 60 cycle Stadio Proces to 111 ft, 90 to 11P 324 63, 1 10P 324 60 kind to there or Marie timber We will ship to talk pay-where Martin Sentation to take at Petrice.

Music and Musical Instruments

PANCED IN ACA — Chelippinals — Committee — Transporter — get Circa Pole era." Virtues Music Schot 36. Bullata N. Y

A NeW hand of our sentatorne A riseles on the unique marks of full harmood Valida demands Artis le repair of Write win Trees Collingwood, Sidd Noodland, Ann Philip elebra, Ph.

VP (No Ran tomate practically, get details.)
 Labeto, 428 14th, Pau Parity Col.

Noveltus

151(**)(**) D French Act Persons I wonly for \$1 00, penals supply. Want worth, 2120-5 Sart Ave., Brooklys., N. Y.

Office Devices

Allert Ref Ver tracks on making ages, digitalist and fallers, foods written account digital ages and history at about 1 and act of the age, ab it different little And today for a tony of bit tiples within A or sing Bate better a tony of bit representation A or sing Bate better the extraction come real properties that the single better the translation of the single between the singl

Optical Goods

ART FICEAL even (Under free, Denver Optic, 50% years wower anderside, All and Free Stockies, All and All Articles of the State of the S

AT A F A 1789 he es by trust to Free trocket

Patent Attorneys

EATE OF True course to applying for parents. Itself tak detay to proteen on your ideas. Send ake of not wide for the unclosur or write for 15 fe though. How to the sine the reason of the endow form. No a large for information on on how to proceed. Combinishess to be at the consideral at Proons careful, efficient as two Characters at the Reseat and Patient Attorney, for this Pank. Pank and the Display of the Patient Attorney, for this Pank. Pank and the Display of the Pank and the P



Professional Outfit GIVEN!

You will naturally expect the American School to. give you the best kind of instruments and took with the best kind of training. This outfit is good enough in use professionally after you finish your training. Mad coupon for description.

O. C. Miller, Director Extension Work



Dept. D-475 Drexel Avenue and 58th Street, Chicago

O. C. Miller. Director Extension Work American School, Dept. D-475 Dretel Avs. und 58th St., Chiengs

Without cost or obligation.

ability to master Drafting at home.

Your offer to send me 3 lemons free and facts about the opportunities in Drafting and about your course, looks good to me, It is understood I am not obligated in any way in making this

Street No.

Peacet Attorneys

INVENTORS' Galos free on request, given valuable into a paper and of our into all the bar on the tap areas of its pre-menta. I gate wide man Region of a paper and I give the account of the paper and make the paper and the paper an Fight to 19

where 'sheet cours and probt' To the today for from and the state of t (No spent annually for ideas) Hundreds now the case

The second of th

Charles to selected a metal des selected and the Laborator of the Park State of the Laborator of the Park State of the Contractor of the C

Fit is a way for to a place or accepting? The algebraiched is respected for the first test and the second form of the second fo 4 h-sin

PA N Print and T who Vigits Built to red A related to the print arranged print parties for the parties of the p

R are I habe to R. Farret Law or Was happened at the season in the Wash series in the Committee of the happened in the ha PAT and Pray Manhagers of the hardson of the hardson of the property of the pr

which a term take the day half a fact a many of the period of the period

The third attachment of a terror and a terror and bound over a second second over a se

the day of the property of the distance beauty

Patents for Sale

FSS STREET Can aux aparts, see for the present trag-est to a less of parties to the trape to a visit design to see 5 kg or to 6.0 steel 5 Mb over the

the Tourise to air. John Thir, feld hand West to a state of house the Party of the

h. 45-15 patents paymented opalpment for our.

Photographs and Supplies

PERSON PROPERTY AND THE THE STATE OF THE SAME OF A STATE OF THE SAME OF THE STATE OF THE SAME OF THE S and the second of the second three or yes the second of th

the first respect over a first than the first specific and several states of the specific to the several states of the specific to the specifi

Pipe and Boder Tuber

FIFT moved hand guaranteed nations for all profi-lling pure unto mote new hour and re-client a new feel man to real to put rough to or a about to the client han first ough think it through, 100 Waynell M. Sawark N. J.

Printing and Engraving

BETTER Print may be used becomes. The first manufacture of the printer would be for the course prompts. It is also p to a blance of the personal blance with Martin Property and

with the machiners with He I Trebuter Market and a set

Flar to Total Control of Control of Total Control of Con note the ter proposal.

PLE ST AL AND PER UP & AND PARAMETERS OF PAR

I R Ha a ser on one one one people lifet and If I know he were in or the fame of the TAP and record Tot ordenice, \$7.66. Sep 11. Suche was a 1868. The law is

the transfer of the first or problem of the second of the

P to m.P. In my Stant his P. H. on Mark P. P. of the Stant Principle Burn her by the St. O. C. Principle Mark Principle Burn Principle Conference Mark P. H. M.

the hance Princing Company, Dresmont, Mark.

Princing Onefer and Supplier

FRINT that offices in a get men of expany factors of the first of the per paper ett. Keiper

Radio

WENTER M. who so to enter the way of a selection of the contract of the contra

Real Estate Orchards Form Londs

To the same of the 1.6 It for fill bring to Fig. Lateral The transport of the second of

Salesmen and Agents Wanted

A PATE TOWN AND A STANDARD BY THE True 1 8 New 6 The state of the s

apperlation to the P addycar for the the mag in the part of the pa

the ser is and to a ser and the ser as the s

the part of a grant part of the large of the second of the

the state of the s A Now the treater year, 2 states flor, are the a respect to the state of the state

bild minory and they ache is a never to a peed feducate for the sould be a peid of the sould be a first principle daily case, to be a finded and feducate the sould be a finded a finded by the sould be a finded as f

A set of an experience of a set of the set o

to the fast of every fit to feature and so that is profess on the light of stated in the state of the state o

Publish I am for making your own proportional produper no me more to the total to the term of the term of

for a service character of the part of the A S CH LOW IND BUILD COME TO BE A STREET TO

\$ or expect out of a disc to begin to his on. More an enter out to Pay out a feat materials on Mills of the property Madeson Continues to an Mills of the property of the second of the second of the last discuss to the history of the second of the second

--at at the part part realized the group of the property of the party of th

A 6 % of heady for one large manufacturer of basels to a decrease of a second of the first of th

A first organization of the first organization of the state of the sta

terrime it continues a by the soul or officer officer of the continues it was a second or officer officer of the continues of

the state of the s

of II to a sale that and the Labour Pile to See & School-

Salemen and Agents Wanted

All Alla for he was a back to day for a vege of the to she had be seen for a least to be shall be she all as a she will be she had so the she had so the she had so the she had so the she had been to see higher and the she had been to see higher to be she she had been to see high to be the she was to she had been to s

LITTERT Ages a real LITTER of event which there is a particular to the property of the propert

by the first of the second sec of the on Incomes

t F t 4 greater profits year record calor row 6-th grad at my 1 man pr 6 th at my Wratter year 1 date F F Sem to a red Pairt t do. 6100 FA, 64 ft a red t ways 1 th at my 1 th a

are from to father of the speech functions on

RELE Raction Water Constraint. Distingly they find the Park of the Art Why is Resident the Resident and Laborators.

To No the L that extract Longitum agencie product the contract of Asset

to the transfer of the first of the second section of the section of the second section of the section of the second section of the sect

A TLE OR COMMITTEE COMMITTEE CONTROL OF THE PROPERTY OF THE PR

A A N TO THE SPINE SERVICE HE PROVIDE BUSY FROM THE PARTY OF THE PARTY

the total malarman common land the land of the five of these ranking a of or me had been been been to the five of the five of

the ten is all a direct of near to annual tradered

And have a life of the to be from the first of the first

\$75 W. E. T. May in training warried with anich long part trains a facilities of two distributes from the first anich to the constitute was to be an addition to the constitute of the constitute

WATT Two and it to proved to read our book "Building a Personance butchers with the by it ments and windows Trible how they encounted year after members on woman Trible how they encounted year after year day on your himselful eith disease. Educate the by It 18" is a large of the way glad him to be a highly and to the part of the

CPT Jagertone a New Prop Share chartes Brig managine.
Plane is the Part of the Control of the managine of the Part of the Control of the Cont

THE TARREST AND ADDRESS OF THE PARTY PARTY IN

to the fing or my \$250 backs from militar flags of about the decrease of the original property of the quarter for the foreign the class from the agreety \$100 to quarter for and several menting per plant out. It is had then Alexandral-ety is one \$100 ft. It is also there are all and alexandralhat more

to the description of the property of the prop

h FNT the project and ag to travel in Front to the state of the project and th produce to the second s 15 H. Stemmen, S. S. S. Longon, Strang. P. Hall

The side he appeared who must make \$1,000 apthe S. W. Now in a case to "The age Start out; S. Land of the district region in the side of sections of the side of the side

Salesmen and Agents Wanted

ACTIVITY is the base are show samples and collect \$17.50 mail that is not alone become needed and the base and age brong needed at the new line hoster 12% it was and colors that at each 7 min has a need to sait has und report for manent but near Did proble stendy income space time in a far my No expenses neede start of the manent was quick for manufact the exhant fartist.

At the fore a new he opposed in the electron and the fartist of the cory water boths for pass in a time train.

From mere and 2025 Monton by making the first and the fartist of the foreign and the first and the fartist of the foreign and the fartist of the foreign and the fartist of the fa

\$7.5 If We be V is in its accessible to 2 for \$1.05 sources and Embarted St. of 1 int we king or distribute. Note that the company Lune 60% Charletters, white

Lane 604 Chelinus, white

NAS perween 25 and 65 to art as man for the sages. No so eximen increasure. A man is a selling experience or willing to learn who can continue teapers and white a willing to work a near as goest overthest season with an account of the same that has a personnent businesses with an account of the same that has a second or a second with the same season of the same of the same

At STS 401 week Special class a rade of one fixed it a life looked one to her rise Seven thing our ultid by We're just Soret hery to her day upong the o

As he fire a B in an district anomalia acting ordered for elements of the Mills to the element of the element o

1996 a fight 1994 A marks on most policing phonon that the particle of the new partner distance in the section distance of the section of the

MAY be Patishing took gleat select his profit for the their finite fluctor and other and the free for the first projecting. Newscape of Manager's Reservices for h

HA 1 SAN N big committeeton, to sell all word in our technical, make to measure entry and overcome for all a graduate for the property of the making a weather each stall, Particular of the first first form of the first stall of the first sta

TAKE Interest for a part light or a and Managers from 15th to 1810 week. The Brake Manager and Managers from 15th to 1810 week. The Brake Manager and the standard or any like the Manager of the Manager

170 I We appeared that broken on \$15 DO dolly within the rest contract the first to prosolution fields believe browling Pil Von Buren. Sope & 6,
Children

Part & unique Parcifolity Whirtwips seller for women, noted decree Allegance \$2.86. 45.4 kmay Mappelouity, have \$63. https://doi.org/10.1006/j.j.

Assets IN the break foodfile Manuales here Staniged with Name and Address for a stateges from h. Jerus Name y Works: Machine Pile.

Hisch. are Recursed and Partitue Display Cards to the control like profile. Terrill Products to Starting Pages Chip.

Parts Chie

Wit PAY him a work farming anto and expenses to be collect our Many and Washing Provider Blanc-Bouch United by 1881 188 1887 makes thirth Money Rangills and Wholesase priors 20c. Wholesase Supply Co. Yakkenta.

TATIANT SC Palgament Largent line made to order today Label contact to proceed that a place procedure to the process of the party of the process of the party of the process of the party o

NIW Corners. Regular black and white photoe finished quickly lands camera. Bishe money selling mining photos with a mining photos of the money selling both. There Campany liest 4th Nurwalk 1 and Applitud Vield Initials on Automobiles. No experiment meeted, \$1.45 profit every for finishment. The first breaking the Nurse maniples "Hales Management." 1941 Washington, Bestim Management of Charles Street, St

A NTST b up hour setting F Z Clean washing reminioned sample and pur cutars from theat Quadry Products of Platfor this Boo from the W to K Y could window let see 1999 person the samples Catalogue. Askas Supe Works, ARRIGOLI South Thickney

A . NTH chargest benefit three million sold has been et inter Sorelly in A71 Herrison t breath HTATE Makinger Shar shots patented envelope Bostor Media 2 MM Fireligies hours because 14 St. Lorde people at The decident market. Established to the tree Company of the sold at the sold of the sold

Fight \$40 weekly and being pelling mans a brokery phiers und on around the repeat business. Full or part a ma. No in estiment necessary wantible pure tree farts at men. Number abries t representation lies 4.4 Philadelphia. Pa.

GALESALAN or Buleawouses with our to universited terrisory. Real maintenaithe connection. It sat executly presenting present from repeat sales of unique automated. viole goals consisted constitutions of every Long established inapolationers (options on vise others. Wells I coment of Cleretator who

MAKE \$200 a week belling toot oracle Prote the the here of a third and resting tomorphic first ease, the hear of a third and specific to the first relies of all agreement for the number of the first policy of the firs



Lance to cood the Prints this amounts now way! Get into the world's richest beducing fluiding! the how quickly you can train for 14 fet in 52 oft a pane! My PREE Both. How to Wood Blue Prints' distinct all the so colled mystocles." All the Prints' disting a stee gives to me distribute the panel of the first than it is not given to me distribute the man best jobs in America. Sund so thereby just qualitative sources.

Port ap the measure of the Print Plan Reading For new matters and present that he has been perfected that has more the armale of men Bills Print it spe to in a curps - ngly should have

The Secret of Big Mency

This is no ordinary school on an it is practical if the state to flesh at a head on many sets of the state of the finite of the state of the

The a the kind of handing a all quick a parte men-int: \$3,000 to \$1,,000 notes of their own. Yet teen 1000 contracting has never of their own. Yet teen 1000 get tright at home n only 2 or 3 months It re-quires or extens r edu-

gtamiwhat on thenbern you can ensuy market al.

IF You blin Hearing has no highly or or in more and a second by a relief by a relief by the december of the relief by the second the me was a pent these time to emergic



Dept. 9-150, 118 East 26th Street, Chicago, IVI.

See what this training has done for others. Bartholcomment in the state ment were strained entered of contents of the state of the state of the contents of the c more cost art of a un than I can do

Amazing Opportunities

Over occur to the disease of the most this year in how a gette to a " See we take, there with a consist of the enters of the ent

Louted

He accept my little git of a conjuste set of rea is se it ofe, Character and other and faremaking **BOOKS** hook Hor Bendlinger o 164.6 that I to mil rainst It un Pr also \ Gen Pate Portrend one part y to 4107, the agent to FREE

Chicago Technical Ecologic. Stept. D 430 Chicago Tech. Building. 121 Feet Joth Scoots, Universe. Illustria.

Please each me pair from both (The to book files Peinte and two feet as and only the Peinte and two feet as a first first both and the first both and the first both and the first both and makes and first both and first both and makes and first both and first bo

Addr Cha

Финистической подпринентации подприн

Make More Money

Read the Money Making Opportunities on pages 116 to 143 of this insura

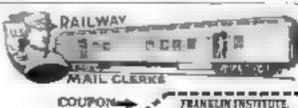
History

Travel on "Uncle Sam's" Payroll RAILWAY POSTAL CLERKS MAIL CARRIERS

\$1700 to \$3000 Year

MEN—BOYS, 17 UP No Layella. Steady Work.

SHOULD MAIL COUPON IMMEDIATELY Paid Vacations.



FRANKLIN INSTITUTE. Dept G 264 Rockester N Y

Other Equation was also been been
Consistent of FREE. No case beek
Consistent of FREE. No case beek
other totals
other and the consistent positions
other beek consistent of the consistent positions
of the consistent of the consistent

NI MAN

Address.



Kaised My Pay 700%

This Book Showed Me How



How would you ley! d your calary sackiraly great of the before I me we country which happened to I A Jeans of Manual after territor the sources Look more sent free to reversady. An us-used cost. No. E. L. beret sens free tu usual case? No. E. L. Partier went from \$1 o day to \$4.00 in year F. J. Water went from \$20 in with 10 drain from temperature of the company at a en aty exceeding

\$10,000 a sear? And my of them started by reading this free book!

The Secret of Big Earnings

All successful man in the world today are master Independent And every main to a determinable of principal would strately obgreamings, you could bear to neil proposely. You is not atmostly the solutions of engine and a ting things has make more act as a me want the to set. There is never this character made than the old saw about suscenar are been put made. Buttarness are made not born. This free belok shows bow?

Big Demand for Master Salesmen

Master Salomes are at a premium in American business today. They are never out of work. They can constraint their own minutes and their own time. They travel and see the country. The works. They dress well, live in he bost homes. Irive their own ears. Aren't these rewards worth going after

How We Help You Succeed

For nearly twenty years, N.S.T. A trusting has been developing Master Salesmen. The National Demolating no Method—an exchange feature—according at home. Our surcess in training nexperienced that thousands of reading business houses have called on at to sumply them with surespect. This service is from-and we have placed thousands of rock in good-paying positions. paying positions

Send for This Free Book

Don't say "I can't sell until you had out whether you can be but. This tree book. May on Nahasawa-ship," process that master salesmen can be made, regardless of personality education or previous willing experience. Send for this free book right now



Dept. D. 5, N S. T . Bidg Chimqu, Ill.

National Selection's Training Association Dept. (2.15 N. S. T. A. Bulleley, Chicago 1tl.

bend me your feet flight rated book. Modern Sales-canot, p. Also tell too how, our causing can be recom-by freques. This does not obligate me. my Income

Name

Address

Age

Occupation

State

Saletmen and Agents Wanted

A SENTE BUT DOUBLE CASE to ARE FOR Firsts and Characters. Resaid for 31 cm back surrentee August Race For the Co. 12 W. Water St. Milwantee Rose Side only New Wide Wilderson Lawrence Phone ones New Wide & Widteprint Laundale, Phila-

Settle a state of the part would tank what full or part time. So as being on the fact of facts with meaning allowed by at \$1 the course as as as a set of the description of the fact been as the first and the course of the course of the course of the course full tank the fact of the course of the course full tank the fact of the course of the course fact of the course of the course full tank the fact of the fact of the fact of the course of the co today Philip Tajk

A. F. N. T. Warra of Fig. 11 - Martinal (Supposed on A. F. N. T. Warra of Fig. 1) - Martinal Composed on the de-Mark that we is a class stress in ever continued to the first continued to the continued to the continued to the plants are a class to the class to

Tale 5 -

Political is calle come any are then did increase actives on a New York and are the come to be for any against a feel of the second of the come of the

A skill a, 4 a

Shop Equipment

high this of and deputies for habier and re-bings at at small that our complete trialing dilution harts, due is take

Stamps and Comes

ATANTHA OR All doll and A courts has a fept by grant the couplet of Takes, extending appearant for Address from Aak for mainty-matter appearant John K burston to color halfs and a vill offer to be a few of the feature for his and with matter matter to complete at the feature for his a a with matter matter from Plant Photology and the feature for his a with matter matter from Plant Photology and the feature for his a set of matter matter from Plant Photology.

properties of the control of the con

At a filler of a goal this man of the other the White-runt and on what is 100 Norman Periode. But The Mar take at a what which is reign that a british of December of a minister and the set thank bull 10 minute. Also a Mengelle of the december of a december.

which is mised formed as even in the street on 1144.

Land Add A. To his of pand Freedige Heapings. 2 to 1950 applicated agent of age Adaptive. 10c 20th different tools. Dr. Tarantages includes the 20th different tools. Dr. Taranta Marinese a be solden 12th 100 150 his his No accesses \$100 150 K. Novano Ministry.

at tree he and bargain list dr. Walter

Stamp a few for the approval application Trans-

Jan 200 Jers A different stamped for most selection of publisher stamped after perform to garden a relection of publisher stamped and the to appropriate performance of the total personal appropriate reals for SOn. I depressed Stampet to the personal appropriate reals for SOn. I depressed Stampet to the personal appropriate reals for SOn. I depressed Stampet to the personal appropriate reals for some

at Valler I bet un 1995 from Postage St. P. S.

Miama France of Tolera 1 1995 of 1995 of 1995 different \$2.75. Richard Fragion Witter to be 2000 different \$2.75. Richard Fragion Witter to be 1995 different for the 1995 different fine to 1995 different fine as heart center 5.81, 300 different Germany War 2012 33.00. 35. Denney, But 31.0. 35.

Stones Wanted

STORY ideas wanted for photopia: a and magaziness. His discussion. A respect to a factor for the factor of the second and distinction is not then the factor than the factor of factor of the contract of the second of the s

Typewriters and Supplies

TYPE WRITE HAS all makes forego prices 5 years pranties and for illustrated entailogue blenny tent to a West 1 4 year New York N Y Tiper per in a West I REST at perviter An, make I you pay its price it rest we pay machine free hataket from Fight pervicer Supply Fulls \$42, 329 Fifth Asp. Pixte-

The Property and standard makes theretely re-manufactured by the famous house Property and should direct from fact or to you on D days' trust transitized a prace have monthly perments. Write who for love catalant Youth your spector (company Days 5764 654 W Randolph & Chrosen.

Wanted

119 TV. TTVES needed everywhere. Experience un-versary Particulars from Write, George Wagner, once accomment Deserves 2190 Broadway N 1 WAN E. Representatives in every factory a fac-niced States. Popular Sciences Manufaly, 250 Fourth

nited states

WANTED You to Well's Lands Bender 90 West Street. New York, for wholesale priors on Havina eigers.

I'll Give You **BULLDOG COUR**

In 48 Hours—or No Cost! Are you thould? Bachful! Sellcountious? Afraid of people? afraid of superiors? (sire ma
48 hours and I'l make you
bristle with BULLDOG LOUR-AGE or no cost Thousands or men stands in ate being and being and being white at the large to the Thousands of men and wences Sin dy been set of finelity news

performance are seen a ete to four-more won time and dear on DAVID & BUSH of per fears

Yet fear to ABSOUTT 1 LANECTSCHILL I have discovered for arms in the box while the inthird car forevert. No temporary is not come in.
No state what higher one to the me had to be
test y extingue—perfectly the state species to the species of
the state almost instantly. If yet it is not a
me complied. The set is swell or a year in 1 ft of you
well to a minute over with a president at we may age. tien darings some millerautisferen.

Only 50 Cents

The Public gives in a late new recent of reach the mains over agents. It is neglet in the strong to be set the mains of the set of the first public of the set of the first public of the set of the s

s will the weakle of a court purious on the true has a construction of a court purious on the true of a court of the court

DAVID V. MUSIN, Publisher 225 N. Michigan Med., Dage K-954 Chenge, IR.

Camera Given

WITH THE COURSE



Year I haden 5000 Professional Marrices FIG P. Mr. 4 american of Professional View Contacts.

For a Microsoft Provide Later tall the later Seems of the second the later tall the later splent in the married Later tall the later talling a sky of the later talling a sky

DIG MONEY IN PHOTOGRAPHY Learn a house in state on or its out reas New York studies. Last white harring waste you paid book

A seried harms and artifera for big bere

New York Institute of Photography, Brys 5 10 West (Ind 51 ook New York, N. Y.



ARPENTERS' HAND BOOK

to the firing a consequence for the que

had a march nell printen entracting entracted passed from the entracted from the entracte

Sold direct by mor only \$1.00 Protputs D A ROGERS

4104-E 27 St Minorapolia, Mino,





the filter with more in the miss appreciately to prome the proof of the filter of the above the proof of the PAGE - DAVIS SCHOOL OF ADVENTISING Deat. 1254 #802 & Block Brown, Chicago, M. S. &.

Advice for POPULAR SCIENCE renders regarding safe and profitable investments. See Page 6.

Men Who Blast for Liquid Gold

(Contained from page 2)

eighteen mites away, while inhabitants of Coffesy the, Harry-five indes distant, said they lett a slight shock.

"V troglycerin explosions can occur in curious ways. Friction is one of the great. est dangers, and we take every precaution

to grand against it

"Suppose, for instance, a little of the fluid should spill in a well-dooter's cur-It slips through close places like quick sever, and might penetrate to the spring leaves, to a bolt, or to some other part where there is friction. You might be driving along an open road some day wien, w thout warning, that drop of nitroglycersn would go utf. It would detonate the whole land. Nabody would ever know what happened

"Escaped in trogiveering bas lasting qualities, too. A man and his son were kided one day by a blast while dust tot a datch near Hemlock, Perrey vacua. The thing remained a mysters into it was learned that they had dug into an old acid ravine from a nitroglycero plant from which a quantity of the fland had

escaped twelve years before

OF COURSE an experienced wellshouter doesn't take any transcess. sary clances. When he loads nitrogly: erm into a s anto, he loads it so it won t leak. Look, here's how it a carried "

Hall turned and lifted the wooden lid to il e rear of his car. Beneath the lid there was a rubber sheet. He drew that back showing a series of separate compartments, fifteen in all, in each of which was

a square tin can-

"These cans hold ten quarts each I mover fill them light occause when notesglycerin gets warm it expands and migat force the corks out or cause too much pressure. Pressure is dangerous. Jolts are transmitted too easily when the liquid in under pressure. In fact, I let it cool off in the cass and form enough of a vacuum to pull the sides in. It's mafer that way

"But that's just part of it. Every can is carned in one of these rubber boots," From one of the compartments be drew out a square rubber container. There was a piece of absorbent waste in the bottons, acting an padding and as a blotter. "The rubber boots." Hill explained, "rest on a rubber sheet. There's a copper pan under that, and between the copper and the car itself there's a sheet of ashestos.

A LL, this is a protection not only against leakage but against heat and friction as well. The way it a loaded, this car could probably come safely through a wreck, provided none of the cans was crushed.

"Methods of handling untroplyceria have undergone some amazing changes since the early days. The railroads used to hall it in refrigerator cars, and demanded that it be frozen before they d take it. Nowadays we believe it s more dangerous that way than as a lagard. ?

This theory was advanced in explanalan of an (Contrased on peop 120

Your Own Little Shop

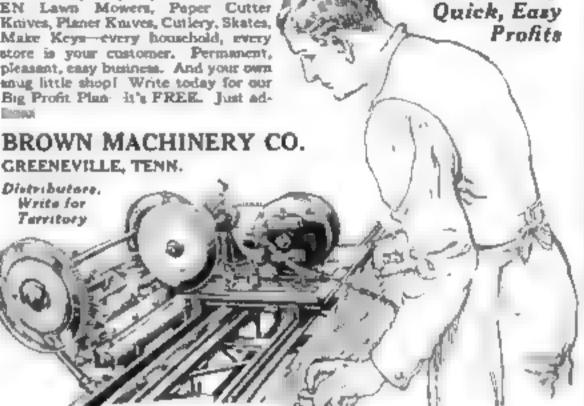
with a "LITTLE SAVAGE GRINDER"

One Man \$1,0

Made Within a Few Weeks Under Our Wonderful New Big Profit Plan, Sent FREE!

Sure, Steady

BE YOUR OWN BOSS! Know the joy of manly independence, BE FREE! Come and go as you please. SHARP-EN Lawn Mowers, Paper Cutter Knives, Planer Knives, Cutlery, Skates, Make Keys every household, every store is your customer. Permanent, pleasant, easy business. And your own inug little shop! Write today for our Big Profit Plan It's FREE. Just ad-





A Practical Provide Power Ord-I also a fearmetern Subur-landes, Truckers Florido Nac-services Feat Concess Country father and Poul ymen

AMERICAN POULTRY MACHINE CO.

Metal Magic If you've never



Mender before you'll think lt'i magic—it saccasy to use Think of soldering as well as no expert, right a your home. You can lust sell your dealer for Kester, the solder SAYODA CAR USA





BUILDING TRADES NEED TRAINED MEN

Thousands of good positions at sood salaries



Today the most vital need of this great building program is men trained menmen who can step right in and do the shilled work that building construction requires.

There is a timp t, easy, practical way by which you can prepare for a better post-You can do it tion, at a bigger salary right at home, in space time, no matter where you live, through the International Correspondence Schools.

A recent investigation of \$3.92\$ (tudents enrolled in L. C. S. Building Trades Courses showed that 1921 had become Auditoria 246 had become Designers 420 had become Chief Draftsmen, 2327 had become Draftsmen 1145

had become Contractors 211 had become American Foregree 4030 had become Foremen 2354 had become Superintendents.

You, too, can have the postion. you want in the work you like best on focume that will give you and your family the home, the comferts, the luxurets you would like them to have,

> Mall the Coupon for Free Booklet

- - TEAR DUT WERE - - - -INTERNATIONAL CORRESPONDENCE SCHOOLS Ban 7824 S. Secaston, Papers.

Without and or obligation, please pend me a very of your brokint, "Who Wise and Why." an full particulary blant the engage de/or which I have marked I

Haul the energy habers with a relation.

Leftition.

Leftition.

Leftition.

Leftition.

Leftition.

Leftition.

Leftition.

Leftition.

The return Profitable of the particular state of the later of the later.

As interested the return on the state of the later.

In apart Plantier

Stant Main, Worker

Plantier Main, Worker

Livit Fag. 1909

Received the post Marking.

Electic Wester

Telephone With

Machine there Practically

Natical on Make Interested

Natical on Plantier

Male interesting the Practical State on Planting the Marking Male on Planting

Natical on Planting

Mindow Triggmen.

Plumbre and Steam Fitter
of the feat for the
price on E ght no med Burya.
The feat and and Tagen
Sheer there are Tagen Paristing
for these Machinerams
disage Mechany things blacked by instance of the control of the co La Louisiah Mantenation Chesh

Aloy ng

Halleng Mail Chesh

Persan

Al sing Inchest

I am Engine Diversion

Matterns y Eng near

Tracit Company or Supt.

Track Manager

Automobiles Proposition Proposition The Maria Probley Malelag

No. or other Street Address City distant. If you reads in Canada, bend 19 a mapon in Informational Oppositioner Schools Constitut, Lambed, Mustrand



Easy to Draw Gartoons When Shows he the SIGHT WAY

Some of the deverest carnocalsto and could article learned how to draw in their space time by following Cartooniak Evans' Simple and Ensy to Laure Method and are now MANN, / NO MINEY Send one 4 post drawings, and are file? Evans see if your dawless, and are file? Evans see if you have shirtly and revelve the Fortfallo of Cartonian and full details about the count, let is not superinger.

THE W L. EVANS SCHOOL OF GARTOONING

Men Who Blast for Liquid Gold

Continued from page 125,

explosion near Tulsa, Okla., not long ago. Several miles from town there are several storage magazines, chiefly in ravines where natural barriers protect the surrounding country. A abooter had gone to one of the magazines to check upthe stock. It was a bitter cold day. A short while after the man entered the magazine, there was a shattering explusing.

One explanation of the tragedy was that the nitroglycerm had been frozen. It was surmoved that two cars had stack together, and that in separating them the shooter had broken an ice crystal or joiled the treacherous contents of one of the caus.

The thawing of frozen attroptycerin is a lask a well-shooter frequently faces, and a ticklish one, too. The nitro must be warmed just enough, and not too much. The vapor from hot water is often used, for the process cannot be hastened. Fire

is taboo. So is live steam.

QUT there are curiously contradictory D properties in this powerful explosive. While it must be thewed without approaching a blaze, it has been known actually to burn without serious consespitessoes."

"One day a magazine near Tulsa caught fire," Hill recalls, "It was discovered by a new employee who didn't know what to do, got frightened, raced into Tulsa, and notified the office. Some experienced men were rushed to the spot, and they found the astroglyceria still barning! It hadn't gotten hot enough to explode, yet. They smothered the blaze with sand and that was all there was to it. The men were beroes, of course, for it was a terrifically basardous thing to do."

Such daring is not always in evidence, where nitroglycerin is concerned. A numher of years ago, a truckload which was passing through Bradford, Pennsylvania, overturaed, somehow Mirsculously

there was no explosion.

"But the driver's arm was caught and held fast by the truck," Hill relates.

The people who wanted to rescue him were afraid of setting off the explosives. and losing their own lives and his. The poor fellow was beid for a half bour, before they family got him free of the wreakage."

HERE have been a good many theories about what could and could not be done safely with nitroglycerm. A half century ago several European natrons forbade its manufacture as too hazardous, But Alfred Nobel, Swedish scientist, inventor of dynamite and now known chiefly as the donor of the Nobel Prizes, contended that miroglycerin was comparatively safe, and urged its general use for industrial work. Strange experiments were made to prove its sufety. For example, a bottle of nitroglycerin was thrown against a rock, without producing an explosion. And when a quantity of the fluid was spread on an anvil and struck with a hammer, each blow, it was

declared, exploded only the portion mimediately under the hammer. Just how for this principle works out is apparently debatable.

"As for oil well shooting, the shooter who isn't on the job every second of the time it out of luck," says Hill. "In one case, in hansas, the shooter lowered a leaky shell into an oil well. As it was going down, some of the introglycerto leaked on to the casing of the well—the casing is the pipe put into the hole as it is dug, to hold back the dirt. Wed, when the second shell passed this point, it scraped, and the frection set off the evenped nitroglycerus. The explosion wrecked the whole casing.

" Another time a cave-in three quarters. of a mile down, caused an inexperienced well-shooter to make a costly miscalculation that nearly wrecked the well. And once, when a shooter at Jennings, Oklahouse, started a shell downward, it was caught by a rise of oil and gas. The shell was beiched out of the hole and exploded on the derrick floor, hilling the shooter.

"COMETIMES, too, the shooter must drive in les through a storm, and work at a wed with lightning flashing overhead. That, in my opinion is one of the most dangerous phases of this work. With 100 quarts of introgrycers in your car, you wouldn't want to there your auto seat with a bolt of lightning,"

In spote of all the experience and knowledge gathered by the profession through years of handling introglyceria. conditions still arise to baille experts. Some Texas fields, for instance, recently presented the puzzle of "self-firing abells,

"When lowered into the holes," Hill explains, "the charges would go off before their scheduled time. Occasionally they could do without a firing squib entirely, and leave the shell to explode steelf. The thing has baffled investigators. My theory is that some chemical or electric action in the ground starts leaks us the shells and the tip buckles, causing fraction which sets off the charges."

How Do You Window-Shop?

THAT women are more interested in shop window displays containing psetures of women, and men more interested m their own sex, was the conclusion of a window display test made recently in New York City. Of the twenty pictures that received most of the pedestrian's gase, only half were of models partly clothed. Animated figures were less successful in holding the continued gase of passers-by than atdl pictures. Only five percent of all pedestrians stopped to look. The average time of inspection was eight accords, with more men stopping than women.

When decoys were used young men and women of good appearance—they proved more effective than the actual display in drawing attention to the win-



Plane Violin
Organ Cisriort
I kulein Finte
Concart Harp
Tromboan Cella,
Samphane Pictolo
Mandoire Caster
highr Singing
Fines According
Voice and Speech
Culture
Harmony and

Demonstration Lasson

offers his wonder in invarious op-per up a bend for them, o ay induce capters resultanced. You if handless Caster
half Singang
Fines Actor does
Voice and Speech
Cutture
Harmony and
Lomposition
Drams and Traps
Automatic Finance,
Factor of the State of Sta

Name

Addition

THE PHARMS

Links tons

PREPARE FOR AN

— thru the only school operated sea department of a large art organ sation. Commercial Artists trained the "Meyer Bork Way sem as high as \$10.000 per year. We today here hundreds of attodents who had previously studied in other art schools. Why? Parassa ways inspectable is Why? Because your instruction is based upon our energial esperi-mee in meeting the art needs of leading advertuers. Flores study instruction. Write for Bustented book talking of the success of our students.

MEYER BOTH COMPANY Michigan Avn. at 20th St. Dopt. 15 Chicago, 1 ll.





Increasing decompletes partnership reasons be hiped to us on the big money by secretary the Manuel Husenberg way through FMS MIN NY STEENBERG CO. MAK IN CONTROL TO BE AND A STEENBERG CO. MAK IN CONTROL TO BE AND A STEENBERG OF THE STEENBERG OF Filter has stated in the commercial and assemble to the commercial and the commercial and



Don't Blame Your Radio Set

(Continued from page 45)

press, it appears that Congress will pass a radio bill that is a compromise arrived at by the Senate and House conferees. Embodied in it are many of the imporlant provisions of both factions. Unless further amended, the bill will provide for a commission which will have full control of radio broadcasting for one year, after that control will be vested in the Secretary of Commerce with a commusion to decide disputes and protests. An appeal to the courts is provided as a last resort.

But you, as a radio fan, cannot expect immediate relief from the present intoserable interference. Even if the bill is passed without further delay, it will take line to organize the commission, and the commission will have to make a careful and comprehensive study of the situation before taking any definite action.

But no matter what system of control is installed, there will be two grave problems that must be settled before order ran be brought out of the present radio chaos. One is: How many stations shall be allowed to broadcast? The other is: Which stations shall be compelled to close down?

As a radio listener, you undoubtedly have formed some very definite opinions on these two important questions as they apply to the broadcasting stations that are received with regularity in your section of the country.

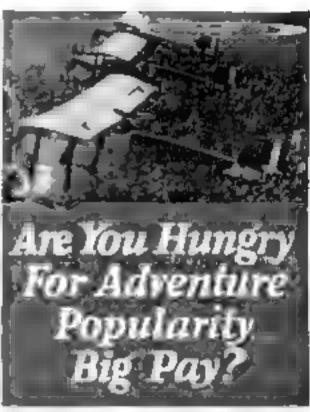
Which stations do you want to continue broadcasting? Which, in your opinion. should be shut down? If you care to write a letter to Popular Science MONTREY incorporating your ideas on this important matter, we will be glad to forward them to whatever controlling agency Congress establishes.

New Publications

Romance in Science, by Prof. Bessie L. Miller. The Stratford Company, There is a Fourth Dimension in Mathematics, but that does not prove there is a Fourth Dimension in Spiritualism, and Einstein does not claim it does, this writer says. Neither does he claim that there is an actual Fourth Dimension in the physical sense that can be felt and smelt and seen. The magazine humorists are off the track, and are joking without their premise.

II ild Birds in City Parks, by Herbert Eugene Walter and Alice Hall Walter The Macualian Company The book tells how to stalk and identify birds without putting salt on their tails, describes 203 species to be found in city parks, and gives all manner of tables concerning their appearance and habits.

Brains of Rate and Men, by C. Judson Herrick, Professor of Neurology, University of Chicago. The University of Chicaro Press. This book reverses the usual process of truring human faculties backward to the animals and traces them forward from animals to men, taking especally the brains of rats and men to prove that the cerebral cortex has evolved.



THEN CHOOSE **AVIATION!**



ARE you a red-blooded, daring he-man? Do you crave adventure, popularity, admiration, and the applause of great crowds? Then why not get into the Aviation Industry-the greatest ad-Yunture mace time began - the greatest thrul ever offered to man?

Think what Aviation offers you. The proise and pland to of the mu itude Ordinary salaries up to \$75 and better than \$200 a week! And a chance to get in on the pround foor where rewards will be unlimited Aviation to growing so swiftly that one can hardly heap track of all the automishing new developments. Air-mail rectan have just been extended to form a test serial network over the entire U.S. Many Commercial Airlines and arrhines factories are now being organized. Man a ke Henry Ford are investing pulptions a the future of commercial Aviation for they see the great possibilities.

Become An Aviation Expert!

Get into this thrilling perfusion at once while the fired is new and uncrowded. Now-by a uniquenew plan-you can quickly incure the bests and preparatory training you need to get started in you need to get started in the Aviation Industry at borns, in spare time. Enperts will teach you the sacrets and fundamentals of Practical Aviation—give you all the inside facts that are queental to your success. And, the study of Aviation by this remarks his method is almost as fundamental as the most as furcinating as the actual work (inelf.

Send for FREE Book!

Bond reupen for my new, free hook just out. Opportunities in the Airplane industry. It is smally interesting reads the aromance and talls you there should fine hatenishing profession you never statistically.

BIG PAT JOBS

per to pily per West FIRST to 1300 per Week Enermoni Profits Report from (10 to \$40 per Want) tio to pay par Week He to \$25 per Week. (1900) a Year and Up Assembler by to Mayor West \$10 to the per West



AMERICAN SCHOOL OF AVIATION 3401 S. Michigon Ava., Dept. 1344, Chicago

Aministra School nr a \$40 t B. Michigan Ave. Without the abignative pter port questes in the Alphane your Control in Principal As	Despt. 2004. Chienge, etc. neapt. 2004. Chienge, etc. neapend me rear FREE Book. "Op- twicety." Also Laterpooling spent tolon.
Neme	
Aldren	
Слу	



Tasis Romance and Adventure In the Far Lands of the Earth

liow often you've longed to see for yourself the awe of has pt a pyramids—the branker of the gorgeous Mediterranean support—the squalor of Chica's ancient

Spand a few years, or the rast of your life, tasting high private that it he manus sense and its off the neight a Krone burds one in he is an included and the sale of the care in he is the sale and the all the print a Krone that its he manus sense and its off the

Unity one profession will earry you ground the world at wit traveled; the a gentleman, but the a the attention of the attention and pleasant with there is built there in Finds there is built there in the color of the source in the source of the color of develop. The structure is the many of develop. repersons and pleasures of world-travel. Hadlo-operators are needed all sep-going ships like the nee-slows here taust carry from one to half a doors of



Take a Look Beyond the Skutine-Without a Penny's Expense

Radio operators alloard ocean liners live hazarously—they rank as officers of the ship. Meals, a private cabin, all other living perds are firmshed free, and besides the operator draws a good salary. You can learn quekly and easily at home in your some time to be a Radio operator through our practical training methods. Take a look at the FREE BOOK which telas bowwoled godnon lieut

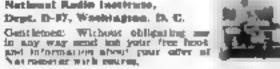
This I' S. G weenment-reengatest school has been training appreciating operating since 1914. Our gradu-ping gradiant the world. We maintain an Finge 2 ment Department on a you in your own ship. The world amous NATREM TER mar own patented haveled among NATH SAFETER and over parented investion, in transported as the best and understand to be least the Radio code. A few short man be with the aid of the famous Nationates and our quark home training, and you too can be a fully quanted Hadio appraise, althing in your capita like the one observe above, bound out for Liverpool of Nagasaka!

Read the Free Book that tells all about this farelecting profession and our practical Government-recognition methods of receive you for it found rempote TOFAY in obligation. Special testing offer now up, includes world-famous Natrometer free of auton can with your course. Art at once.

HATINHAL BANKS ENGTITUTE WASHINGTON, D. C.

SPRICIAL OFFICE COUPOR

Nathaust Radio Incidence. Dept. D-17, Washington, D. C.



World Paper Sutrementer

Name

Add took

Marvels of Scaffolding

(Continued from page 30)

the foundations, buse mechanical mixers perparing concrete for enusons and retaining walls, towering derricks lifting sted beams and setting them in place, and daring structural workers scampering over the beams, bolting and riveting them together. Seldom, however, do we realize the enormous task involved in clothing the steel skeleton with walls. Yet this problem, perhaps more than any other, heretofore has limited the height to which buildings could go. It has been solved at last, only after a struggle between American engineering ingenuity and the laws of gravity.

With the first true steel skyscraper, a score of years ago, there developed, almost overnight, a new race of working acrobats. Without staging, often without even a ladder, they rode the beams and columns flung around by derricks, and worked with a speed and damng which would have made our tree-clumbing progenitors gasts.

I T the veneer of brack, atome or terra-B cutta could not be placed so easily from inside. Speed and economy of labor required that every square inch of the building exterior must be reached easily by human hands. Staging built up from the ground, for heavy nusterials and many men, might serve the purpose on to a height of some as stories, but beyond that point the forest of timbers became too beavy, the cost excessive, and the hazards out of reason.

Many schemes were devised. The block and tackle was discarded early, for the bazards of rope, weight, knots, and so on, were too great. Hundreds of mechanical contrivances were built, tried and arranged, and many accidents occurred. But finally, out of the human laboratory there merged principles and designs that brought into being our

great towers of industry

As early as 1910, the hanging scuffold demonstrated its mfety. Pifty workmen, busy on a suspended platform over the great plaza of the Grand Central Terminal in New York, escaped unscathed when a terrific gas explosion went. off directly beneath them, killing twelve and injuring more than a hundred men working in other locations. And by 1914 this type of scaffolding had become so reliable. that the walls of the Woolworth Buddens were erected without the loss of a life.

TODAY the suspended scaffold is so secure that even if one or two of the wire cables should map, the platform and its load would not fall. The planes are overlapped in such a way that if a cuble gives way, they will lock together and support themselves!

The method of operating the trapere scaffold, like the machine itself, is typically American. A number of large concerns supply "scaffold service" to builders. Each employs a force of skilled riggers, builds and rents equipment, installs, inspects and maintains it in good condition.

The time-rental basis undoubtedly

leads to economy and rapidity of erection. Perhaps the greatest economy lies in the fact that the new scaffold ing can be quickly changed to a new elevation without interruption of work-With stationary scaffolding, it was necessary to move workmen and maternals from the platform before its position could be changed. This meant oss of time, with a corresponding increase. in cost of construction. Now, however, the hanging platform can be raised quickly with a few strokes of a lever which winds the strong steel cables on the housing drums. If the work requires, one end of the platform may be fixed several feet higher than the other.

A recent development which has done much to facilitate high construction is the architectural design of akyserapera providing for a succession of steps or setbacks, beginning twenty to forty stories up, each of which serves as a working ledge from which materials may be passed on to the next ledge. By this method, there is variably no mechanical limit to beight, for the hanging scaffolding can be

raused indefinitely

BRIDGES, with their great steel and concrete arches, also have taxed the ingenuity of scaffold experts. Sometimes the bridge must span a chasin where falsework is out of the question. In Brazil, for example, a suspension bridge with a main span of 1,114 feet recently was erected without the use of any falsework whatever By ingensors methods the main cables were employed to carry workmen and materials.

The acuffold cost may make or break the bridge builder. Not many years ago expert designers on the great Hell Gale bridge in New York fairly outdid them selves in climinating the last unnecessary pound of steel in the structure. But they neglected the question of falsework design for the unusual type of bridge they evolved. As a result, the greatly increased cost of erection considerably more than absorbed the saving in steel.

The scaffold expert also plays an important role when high chimneys, power plant stacks or church towers are to be built. Every job offers a different problem. In the past it has been necessary often to erect staging the full height of a stack or tower, both inside and out, Here. again, the hanging platform is doing much to samplely the task. For example, a great building in New York will have a ventdating stack 575 feet high, and every square foot of its inside surface is being plastered from suspended scaffolding.

HERETOFORE not a little of the cost, as well as the bazard, of scale folding has been in its removal. Wooden staging, such as church towers and hoists have required, must be taken down slowly. and carefully, beginning at the top. Considering that stagings for 400-foot church towers, and 590-foot hourt towers, have been erected, the task is a long and tediour one. Again the advantages of the new "trapeae" methods are obvious.



If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of app kallons for patents are filed in the U.S. Parent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and he natically nationally against the hundre of and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in d ag the application sometimes many the last application and the last application are the last application and the last application are the last applic 5n fner m ng the appointion cometimes mean the loss of a patent Cut in touch with me at once by mailing the coupon below.

Prompt, Careful, Efficient Service

This large, superionced organization devotes its entire time and attention to patent and trademark cases. Our offices are directly across the street from the U.S. Patent Office. We understand the rechnical tree of patent We know the rules and requirements of the Patent Office proceed in the quirkest sefect and best ways in preparing an application for a patent covering your idea. Our success has been built on the aircraft of careful, efficient, estimatory service to tavesters and trademark owners located in every state in the Union.

Strict Secrecy Preserved-Write Me in Confidence

All communications, ekstehes, drawings, site, are held in strictest confidence in strong, steel, firepeaul files, which are accessible easy to authorized members of my staff. Feel free to write me fully and frankly. Your task was have my personal attention. It is probable that I can be p you. Highest references. But FIRST—cup the coupes and get my free book. Do THAT right new.

No Charge for Information On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will send you my Record of Invention form, on which you can sketch your idea and establish its data before a witness. Such evidence may later prove value able to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention form, together with detailed information on how to proceed and the costs involved. Do this NOW No need to lose a The coupon will bring you complete information entirely minutes time. without charge or obligation,

Clarence A. O'Brien

Registered Potent Attorney

Member of Bar of: Supreme Court of the United Status; Court of Appenia, District of Columbia Supreme Court, District of Columbia; United Status Court of Chime,

PRACTICE CONFINED EXCLUSIVELY TO PATENTS, TRADEMARKS AND COPYRIGHTS

Write for these Free Books MILERIA OF THIS IS HOW

CLARENCE A. O'BRIEN

Registered Fatent Attorney

60- M Security Savings & Commercial Bank Bidg. (

Please aend me your free book, "How to Obrain a Patent," and your "Record of Invention" form without any cost or obligation on my part

****апи

Address

(Important: Print or Wette name clearly

PATENTS Booklet Free Promptness Assured

Highest References Rest Results

Send drawing or model for preliminary frammation of Patent Office records

ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION

Listed Patent Lawyer in the latest editions of the Rand-McNally Directory of Bankers and Attorneys, Chicago, Ill.; The Baggott & Ryall Directory of Attorneys, New York City; The Lawyers Guaranteed Directory, Detroit, Michigan, The Lawyers and Bankers Quarterly, published by the Legal Directory Publishing Company of St. Louis, Ma.; the American Lawyers Annual, Cleveland, Ohio.

WATSON E. COLEMAN, BEGISTERED PATENT LAWYER

734-5th Street, N. W., Victor Building

WASHINGTON, D. C.

Untern States Captrol'

PATENTS

DON'T LOSE YOUR RIGHTS TO PATENT PROTECTION

Before discharing your invention to assessment for plack on "EXIDENCE OF CON CEPTION" to be signed and a messet to repate ed. patent inversion all ever the condition of the only of the advance of the condition one. The bean its limited to discern on an inde-patent one condition of concern of the patents and schedule of constant upon request

LANCASTER & ALLWINE

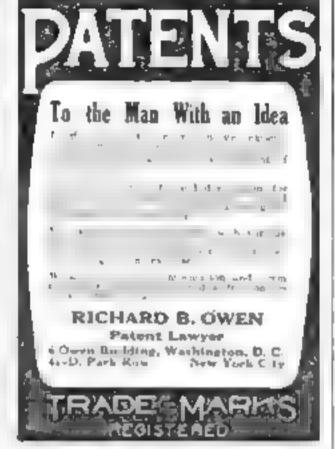
274 Owen Suilding WASHINGTON, D. C.

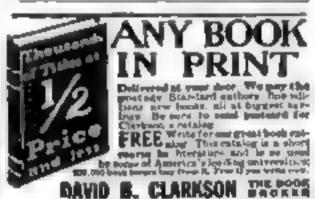
Origination of Service "Existences of Consequence,"

1000 NEEDED

Here is the most remerkable book ever offered to target up. One Thomsund needs investions lated and reserving Arthurges as it has theretael Problems Arthurges as it has theretael Problems Arthurges as it has theretael Problems Italian Arthurges are inventions. This book may give you one need that will have you one need that will have you one need that will have you one that will have you are need to be its problems of a corresponding problems. It is it is it is problem at an entrance expense I will be its problems from your entrance expense. I will be it in place at a less ing person die magnetoe Over I problem at the it in place and a series of the posture of a series of the place of the corresponding to the series of the place of the corresponding to the series of the corresponding to the series of the corresponding to the series of the corresponding to th Here is the most remarkable book ever offered to

BUNKAU OF INVENTIVE SCIENCE Dept. 14 Rockerber, New York





420 CLASSISON PARLICIPA.

and by many well b

gencaso, the

S do one of the about put-ent firms to America we give investers at lowest consistent oberge, a

PROTECT YOUR IDEAS

Send for our Guide Book, HOW TO GET YOUR PATENT, and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send model or sketch and description

of your invention for Inspec- tion and Instructions Free. Terms Reasonable. Best References.

RANDOLPH Dept. 130, Washington, D. C. i



Shall We Scrap the Yardstick?

(Continued from page 33)

1700 that the French National Assembly made law the metric system-invented, some say, by the Englishman, James Watt, or, as others declare, by French scientists. Rapidly it spread to other countries, until now it is the standard of a billion of the world's inhabitants.

At the International Bureau of Weights and Measures at Sevres, France, is a platinum-iridium bar, triple-locked in a subterranean vault. Three different keys are required to enter, each held by a high official, for the procious possession within, measured by two scratches on the bar, is the world's standard meter. No master financier of crookdom has ever attempted to tamper with it, but they are taking no chances.

YET, priceless as it is as a standard of almost inconcervable accuracy. the bar is not irreplaceable. Destroy it, and you would not have destroyed the metric system. For the meter, tangibly represented by these scratches, is defined in terms of a measurement that can never change, no matter if the earth should pucker like a deed apple or rock from its orbit-in terms of light itself. The glowing red rays of heated enummin are more (mountable even than the universe, and their wave length fixes forever the length of the world's meter.

Is this scientific yardstick wholly unfuindian to you? You are better acquainted with the meter and its colleagues, the gram and the liter, than you suppose. Here and there, the metric system popul up with considerable frequency in your daily life.

When you prepare to tune in on a radio concert, you consult the program listed in the newspaper. There you find the station you wish to hear; opposite, its wave length is given. In meters!

Each time you spend a nuckel, you are parting with exactly five grams of metal; for the U.S. Mint determines the weight of its come by the metric system.

For yacht races, the six-meter yacht is standard. A new six-cylinder automobile in advertised as a 2% liter car—giving a vivid picture of the size of its cylinders' bore and stroke, through the metric unit of cubic capacity. In photography, all standard motion picture film in made exactly three and a half centimeters wide.

MOSE of us who diet—whether our Third or us was more or just good health-are well acquainted with the calone, heat-unit of food, Scientista speak of the calorie as the amount of heat it would take to ruse one little c.c. of water one centigrade or metric degree of temperature or nearly two of our degrees. It is a 100 percent metric unit.

Could the United States adopt the metric system without too much confusion at the start? "We could iron out all the differences in, say, a ten year period," declare its advocates, "Other countries, too, had their periods of readjustment in adopting it. In the end the whole country benefits.

ATENTS TRADEMARKS



OUR OFFER:

Your first step

Before disclosing an invention the inventor should write for our blank form "RELORD OF INVENTION." This should be signed, witnessed and returned to us together with model or sketch and description of the invention for INSPECTION and INSTRUCTIONS

NO CHARGE FOR THE ABOVE INFORMATION

Our Four Books Mailed Free to Inventors

Ow Illustrated Guide Book

HOW TO OBTAIN A PATENT

Contains full instructions regarding U. S. Patents, Our Methods, Terms, and roo Mechanical Movements illustrated and described



Shows value and necessity of Trade-Mark Protection. Information regarding Trade-Marks and unfair competition in trade.

OUR FOREIGN BOOK

We have Direct Agencies in Foreign Countries, and secure Foreign Patents in shortest time and at lowest cost

Progress of Invention

Description of World's Most Pressing Problems by Leading Scientists and Inventors

ALL COMMUNICATIONS AND DATA STRICTLY CONFIDENTIAL INTERFERENCE AND INFRINGEMENT SUITS PROSECUTED

IMPORTANT

TO MAKE YOUR CASE SPECIAL AND AVOID DELAY YOU SHOULD HAVE YOUR CASE MADE SPECIAL, IN OUR OFFICE to secure protection, save correspondence and obtain early filing date in Patent Office. To secure special preparation of your case send \$25.00 on account with model or sketch and description of your invention.



Private Office, Victor J. Evers, with view of Patent Office Through Window

Highest References Prompt Attention Ressumable Terms
VICTOR J. EVANS & CO., Patent Attorneys

Main Offices: 760-8th St., N. W., Washington, D. C. Gentlemen Please send me FREE OF CHARGE your books as described above.

Address....



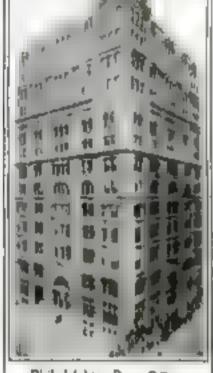
Chicago III. Office Suite 1114 Ta ome Bldg



Patromet Pa., Office Softe \$14 Propfer II de-



San Francisco, Cal. Office Suita 2010 Hobart Bldg



New York Office Suite 1007 West Iwarth Bldg

Philadelphia, Pa., Office Suite 518-519 Liberty Bldg



Washington, D. C., Office Victor Bidg

COUPON

POPULAR BOOKLETS OF

SCIENCE

Little Blue Books at Amezing Bargaine About 15,000 Words in Each Book-Your Choice

Order by Number-

60 Nation of Science 178 Femalalisms of Sciences 409 Grant Man of Spins Hill Parent Discovering to Below BO) Wenders of Radius 200 Wesdern of Radium
200 X-Rev Vinler day vis.
406 Correson's Retaining Captained
200 hedschools on Madern, Scinerson Healing
(3) Principles of Disciplining
(4) Charter Energy
(2) Healing & Life
(1) Origin & Sahare of Cris
(2) Frinciples of Life
(2) Frinciples of Life
(3) Frinciples of Life
(5) Levisterment of Life
(5) Levisterment of Life
(6) Relating the Mysbery of See
Corrett Comets IOL Origin of Ademic Things 109 fire the Planety Intelliged El? Greek Physics & Menters Ecrowski
Ecrowski
Chi Life Aurorigi the Sure.
(Se Life Aurorigi the Sure.
(Se Life Aurorigi the Sureterfilian
Bitt Life Armong the Designation
Bitt Life Armong the Army
Bitt Life Armong the Rate
Bitt Life Armong the Rate
Bitt Representation
Bitter Type
E72 Destinating the Passin
Life Army
Life Armong the Passin
Life Lawren maintable at Relimpip
Life Lawren maintable at Relimpip
Life Lawren Statil Auroria Land mattebook kanngi. Judagy Sali Taugsa District Transfer Sugar District Part of the Control of the Contro What Makes If and Why Bhil How to Know the Song Blinds St. Generals for Supremys 100 Expenses Made Mate 1900 i Marania Maria Maria i i 1900 i \$22 Introduction to Mendality

\$3 Mayor to 6 my 100 Years

\$6 E-pointing Made Main

\$21 Mining of E-pointing

\$50 Mayor of E-pointing Creation UJ Commission 1 no Md Contaction in Duples 12 Mar B. His Parations
42 Deglie of the Human Roos
47 Accompt of America Sacr
274 Accompt of America Sacr
274 Accompt of America
274 Accompt of America
274 Accompt of America
274 Accompt
275 March 1888 Compt
275 March

275 Building of the Earth 815 Age of Meaningto 845 Age of Meanington 845 Americal of the Form 888 Barried of the Fitteel

527 The ice Age
661 The State Amb
761 Beighte of a Developer
71 Penning of Explication
12th Samplicity of English
12th Samplicity of English
12th Penningsupity Saff Tamplic
661 Prychology for Englishment
162 Prychology for Englishment
162 Prychology for Englishment
163 Prychology for Englishment
164 Prychology for Englishment
165 Prychology for Englishment
165 Prychology for Englishment
165 Prychology for Englishment
165 Prychology
165 P

Correso 764 Tents Dent to Populati familyaid 808 See in Proctor Analysis 61. Habare of Orname 106 Frend on Monp & Marrel

1864 See Symbolished 1855 Partners of Continuets, S. Emmi-1815. pilled instantly 6. Billion Macon)
Disardory
[69] Massary Whot Pris,
[74] Duart 6. 10 Problemb
66] E. periminant in Austral Papage
(190) Prist Limits of Security-

Tri betrilighed of Yerschare Springs of the Restaura His Behaviorish Sewal Pro challege 's Dead & Madisple Personality

1053 Pershalogy of Augustra 10-14 Council of Foot 104 Council National of Gentlem Mar Facts Abdol Representations

Ph. Famil and Draft

25 Extrag 54s Would by 68h mit 6. Manth Springs 75s rath About Proons Mode-136 Broughes, Bagainners, Scotler

finess elemajiya BPS Distantin, Chapta II, Frequencia) (Dij. Fijata Almiji Cancari Dijata Almiji Cancari

176 by to Admin Venezuel Dispesses (D. Sephilia Biref Templia 14 Physiology of Seri Life

142 Physiology or an expension of the 162 Physiology or the 164 Physiology or the 164 Physiology of the 164 Physiology or Spire & Confessions of the 164 Physiology of the 164 P

Cod Main Proteins Chainful of Human Iris. Mattern in State of the Main Iris. Mattern in State of the Main Marian (Con Chairmann) Man. Jun. of Committee of the Main Iris. In State of the Main Iris. In State of the Main Iris.

WY Fre Shelm Breitige, str. H &.

364 Leaf Familiel: Breggien: 190 Liver Marchal Philopophia 445-886 Paperson Research (E sels.)

ORDER BY PUMBER If you want "The low Age" put down 347" Your choice to per book as mady for it be at you like. Add to per book for pack an arrive of your order will be phapped approve collect. Canadian and foreign select to per book. New Catalings, thating 1,200 different Little Blue Books, included with all orders or free on

HALDEMAN-JULIUS PUBLICATIONS GIRARD, KANSAS



What Does Your Garage Cost You?

(Continued from page 22)

help to obtain uniform slopes in each section. A good muson will finish the job with float and trowel so there are no perceptible redges between the four sections, and the whole floor slopes inward with perfect uniformity

Have a concrete apron with outward slope at the garage entrance, if possible. If a driveway of the same material is made, it should be six melies thick on a stone or conder base. Such a slab allows for the weight of coal trucks. Seven feet is about the least width for a straight

drive. If the paving is in twin strip style, each strip may be two feet wale.

Whether the drive is complete or half paved, it is improved by a sloping four melt curb mong the outer edges. Ordenary concrete needs two or three weeks to harsten before usage, and it should be kept damp during that period. In cold chinates it is a good idea to make a drive with dark colored coment, which will cooperate with the min in melting snow and see in winter. Color may be added or the new twenty-four-hour-hardening cement, which is quite brown, may be used.

EVEN a feature garage should have a food above the ground | Imbedition boltvevery four feet in the soft concrete so as to provale unchorage for the two by six sill of cypress or fir. I saw a foreign workman do this job lately for a neighbor, and had to actua re his conscientions tarring of the underside of the sill before placing (t. Ten population of labor on such a detail may add ton years to the life of the building Creosote is fine for this, and a dose of used engine on is better than nothing

It is no extravagance to build a frame garage according to the standards of house construction. However, stude may be spaced a little under, say twenty niches, and a peak roof may be framed with two by fours a couple of feet apart. Some cross braces at and above ceiling beight will help to stiffen the roof. For walls of extra warmth, apply sheathing boards or fiber hunber outside studding, then building paper, and finish with siding, shingles or stucco. Otherwise, siding may be ditectly nailed to atuda, while wood or metal lath provides backing for stucco, as slungle lath does for shungles.

M ASONRY walls of the usual eight-men thickness are simple to put up. Sills and lintels for windows in them can be built in place of poured concrete, with a little reinforcement provided for the lintels. A solid wall of stone or brick will be door if furred inside, while the air. spaces in hollow tile and concrete blocks generally obviate the need of such protection against dampness.

Have the roof covering match that of the house, if possible. Since the roof is usually conspicuous and is also subject to special fire hazard, it should be goodlooking and as safe as possible.

A roof that is absolutely fireproof and costs nothing for repairs can be made of reinforced concrete. The job is simple for A one-cut garage (Continued on page 1.11)



to street comic forms like these in \$1 a

Period that a bust makes address and then, and led me mail to a Tent I expend ("her which will beach you have to draw counts facts. Whether you about you have takent or next make this teriencering rear. I want to stoke you have the with the aid of my Pictoria Chart. Method of cartillest existent drawing fully cap tighted and heat evident of by this richard. The rank few is the souls faction his and unquantly profitable professions and ours message white professions and ours message white

of her throad out so being he sold has thebad out to have he foundly famous cartison-ics. With the Teo Levels and will send our being same samples of their such and facing the of there were and facts almost on a way which will show the pass the fact the Flence cortain to the again, a for post-

C. N. Landon, Director

THE LANDON SCHOOL 4351 Notional Bidge (Shreeland, Onla





WRITE FOR FREE SAMPLES

HAVE YOU AN INVENTION?

If so the WORLD PROURESS w II

Surgrational in Fate start at in Investigate Newleck Wa-towise manufacturers to address at reparting assem-tions they want. Subscription for our year 40 count. WORLD PROGRESS PUB. CO., INC.

"Will Sounce putents commercial value, toyalty bosis, manufactured for \$5 and under. Matt model and copy of putents or full dentils. Kamptome Reiding Corp., 41 Rest 43rd \$6.4 New York,"



What Does Your Garage Cost You?

Continued from page 137)

where no central pillant with steel beam. are required. There is a continuous selfsupporting slab with bearings on the side walls, which should be mesonry. It is convenient to make the concrete floor first, so as to have a firm and even bearing for roof form supports. The latter may be ordinary studs spaced three feet spart, upholding edgewise two by fours which are spaced at two-foot intervals. Then lay a tight flooring of one-inch shiplap boards, using small pails for ease of later removal. It pays to paint the boards on both sides before placing with any hand of oil, in-cluding used engine oil. This prevents warping and makes a smooth ceiling. The form may be built level, since the upper surface of the concrete can be straightedged to the slight slope required.

THE reinforcement should extend over three fourths of the width of the bearing walls and should be within an meh of the stab bottom. If one side is the house wall, it is safer to build a horizontal reinforced beam on that aide than to depend on drilled holes with metal roof rods grouted in. Metal may be kept off the form bottom by bits of shingle lath and by a first layer of grout or bound cement. Remove some of the lath pieces as the material stiffens. Any that remain can be chueled out of the ceiling later and the spaces filled with cement

Tables issued by metal and cement magers climinate guesswork as to the amount of reinforcement needed. It is entiest to use expanded metal or wire mesh that is specially designed for a given span. But where such material is not available it is all right to use half-inclurods of round section or the equivalent in square. For a span of eleven feet, space these bars eight mehes apart and make the slab four and one half mehes thick For a span of twelve feet the bars are half an inch closer and the slab is five inches thick. Another foot mided to the span calls for seven-meh spacing of rods with half an inch added to slab depth. At fourteen feet the slab is no thicker, but the rods are an inches apart. To prevent temperature cracks, cross the rods with a medium weight of new wire fencing.

T 00 many garage doors are flimsy and is better to have doors that fold or slide inward, being suspended from above. Track, rollers and other fittings may cost around fifteen dollars. Doors in three leaves lunged together are suitable, one leaf making a convenient service entrance. The best doors, which need no braces. are double thick one-inch tongue-andgroove boards, the outside vertical and the made horizontal, with inside screws holding the two layers together

Mr. McMahon's services are available to our readers to assist them in solving their building problems. Letters will he answered free of charge. Address John R. McMahon, POPULAR SCIENCE. MONTHLY, 250 Fourth Avenue, New York City.

PATENTS

A HERE is no work known which requires a more skulful and exact use of the English language than patent applications. A bungled patent application may deprive you of all profit from your invention. The time, the energy and the expense you have already given, deserves the services of an experienced, reliable patent attorney, especially when his fees are moderate.

MUNN & CO. PATENT ATTORNEYS

Associated for BI years with the Scientific American

1983 SCIENTIFIC AMERICAN BLDG. 24 West 40th Stend, New York

522 SCIENTIFIC AMERICAN BLDG. Washington, D. C.

519 VAN NUYS BUILDING Les Angeles, Col.

1311 TOWER BUILDING Chuage, III

664 HOBART BUILDING San Francisco, Col.

Ask for free copy of "Patents-A Book of Facts Every Inventor Should Know" and for "Inventor's Diary." Send for them NOW.



PATENTS

Trade-marks, Copyrights, Patent Litigation, Handbook with illustrations, 100 mechanical movements. Sent free or request

ALBERT E. DIETERICH

Parmerly member Renows ng Corp. 1. S. Palent Office. Patent parager and Solventor. St years experience, D. C.

661 A Ouray Stdg.



YOU CAN EARN UP TO \$250 PER MONTH

Salary and Expenses

as a Railway Traffic Inspector 1 have many openings in this lawyers og and distribled profession where ou eee upp such a and farce each minute are proclassly tour surp toses are produced rapidly facult are regular and work is healthful

Position Secured for you

I track you Traffic Inspection in 2 must be share time bones at ady and uses considerate, and "et; offer true a past as pastess \$120 to \$154 per tracket salary or return your altion let the show you by the for from my graduated, and being you my brokelet "A Profession of Protection." Writing my leading.

Jumes T Jarrett Pres. STANDARD BUSINESS TRAIN, INST., DIV 3, BUFFALD, N. Y



DRAWING to FORTU

Al Hafed, a Pers an farmer sold to serve to go Cut and sork has bertune. He was assume the terms found to contain the distance of an extension of the contains the contai him felightness? Fich to least over the great opport is to at hot draw the face which is approached which played after a proach that.

DO YOU LIKE TO DRAW?

If you do the an almost certain indication that you have take for a court which feet them there is the Ratoria example and was active for fortune. The chip plant takens by our fortune. then all 3 may be broaden

MANY EARN \$200 00 TO \$500.00 A MONTH AND MORE

Present opportunities in both men and wence to all little diseases the tries part of the bar because the part of the particular tries and the particular tries of the part Hart is my a the locaret type of all quemonts work, yielding a nego ne no

THE FEDERAL COURSE IS A PROVEN RESULT GETTER

It is the only Hope Study Course which has been built by over day our andy on an areas of the built built. North M. Mer. North and A. Charles are greated that I need houseanne For. actioning Commit-

FREE-"A Road to Sigger Things"

of on like to signs and should read this from book before deep upon the a work of elle books if as Company as a mixing party to which is problem and deal about the formation of problem and deal about the contract of the formation of the formati Circle Line Breed

dera

4147 Federal S have Bidg

Minnespelia, Minn

OPPORTUNITIES IN raffic Management Become a Traffic Expert

The opportunities in truffic management are limited only by the boundaries of the business The trained traffic man is in demand by transportation eyeterns and by "ideatrial organizations,

Three Detroit Firms
Pay Their Traffic Monagers
Over \$20,000 a Year

Propert for this stowing profit- k able profession at home in your perv time under appervision of traffic expects. Low cost, anny terms. Thru the LaSalle Problem Method you learn by doing Valuable 61-page booklet from



This Book FREE

Send for it NOW Latello Extension University, Bepl, 483-T Chicago

Conquerors of the North

Cantressed from page 21.

we found ourselves in a gully totally unfamiliar to me. Here was a cabin, and the dogs headed straight for it. They erashed through the half-open door. a barking, snarling tangle. I knew then that they were seeking nourishment After feeding them and permitting them a short rest, I again headed north. The snow was whirling and whistling.

Up in front I could see Singen giving every ounce of his great strength to the task, tatisfied at last to go in the direction I thought best. Slowly and laborously the dogs went up a long hill and then started down the steep grade on the other side. Soon the pace was terrific. With no load to pull, the Scherians were letting themselves out

"The snow, cutting my face like fly ing razar blades, forced me to close nov eves, but I opened them often, to keep Down from freezing slock. It was during one of these seconds that the bluzgard seemed to lift and 1 saw what I believed was char level greend ahead. The next instant I realized my motake. The clear level space was mill on, more substant althan a r. We were those a pidred feet or less rom a precipies at the foot of work one hundred feet allow was the Bertin, Seal

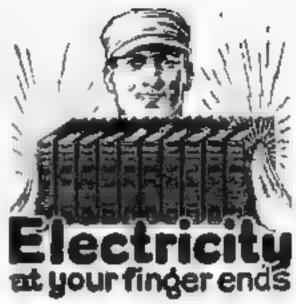
"IF sport any ours and smooth as glazest class. The dogs were red ing. pell taril straight for destructors. Unail to II ak fast. Ja unce gar y pole 11 combthe crust. I made a break. Gradually the drag against the dogs told and 1 is slowed up, finally counting to a haltwith Sigger ass than (went) feet from the hims.

Het one danger was not vet over The hill on which we were anchored was so steep that it would have been inpossible for me to crawl back up. Besides I wanted to save my dogs at any cost Without them out there in the wilderness iny afe wouldn't be worth a d-tac-

"There was but one hope-tlut I could get Sugges to burn and clumb back up the bill, inducing the other dogs to follow hum. I called and pleaded with my leader to 'Gee,' but the wind howled so be couldn't hear me. Minutes dragged like hours. Then came another full in the blizzend, and again I shouted to Suggen. This time he heard and understood

CLOWLY, carefully, this opleaded Siberian turned and started back up the hill, his sharp toenads scratching deep enough into the ice crust to give him a footing. One by one the others took their cue from him and soon had turned completely around headed out of danger But I don't believe I took a deep breath until the leaders passed over the crest and started down the other arte-That was the closest I ever came to death on the trails. But it was close enough!

Seppala didu t win the colorful sweepstakes that your, the first time he entered them, but he learned a lot about dog racing and trail craft. And when, in 19.5, he entered the race over the 408-m.le trail that leads from Nome to Borng I m' has a to pay 2 Sea to Camille on



Recor the fasts in Electricity. They man route purers and better position for pro. Hawking Coloida fall you all you need to know about Electricity. However and the tentered analysis to every his your tenter to be to be the profession of the fast in the study and apply A non-piers practical working course in 19 volumes. Common new particularies of Bealish severy. Orders set to day to look over

HAWKINS GUIDES

2500 PAGES 4700 PICTURES

These books tell you all about --Magnetium Induction - Reperimen 8 - synamon
the his Macistery Months - Argundres - Artunings
Windows Installing of Dynamon - Electrical entrymore Testing Provides Management of Yearson and
Matter basis basis Synamon Wis to Welling Bayesma
were Plantery Storage Barreries Provides of Allarparing Corrects and Alforna one-Arts in leg (1,125pt
Market Storage Corrects a new Storage Rectalists As noparing Corrects Storage of Storage Rectalists As noparing Correct Storage of Storage Rectalists Meanwhite
the amends South Bounds Wing Storage Rectalists

1.25th of Planters Also many Monters Provides to InLatting Telephone Telephone Provides to InLatting Telephone Rectalists (Monters Provides Applications of Alson Section and Ready Reference Index

SHIPPED TO YOUR FREE

Not a rest to pay partition to the bracks. No official time
table, interest our are satisfied. We said of partition to the
attribute our gay in the present of the completes returned.



Nathe



phonon actions marriages by Call systems that our dispet, in- year years partitioned delay and \$2 the person brind offer frameling their. It before forms INTERNATIONAL TYPEWRITEREX, 186 W. Lake St. Dogs. 408 Chicago



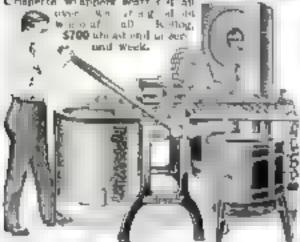
HIB ONE DAY SATISAN

Start value own his business now.
Small payment in age complete
ou fit for recharging mun and Money back Schrange Windship HOBART BROS. CO. (Suy termi.

Son F47, Troy OMe ONLY \$1659 MONTHLY -

100 CLEARED ~ IN ONE DAY

So writes W. H. Adams of Ohio in August 1925. V. A. Marini of California reports \$11275 sales in 3 months. Jacob Gordon of New Jersey "\$4000 profits in 2 months," Alexander of Penna. "\$3000 profits in 2 months," Alexander of Penna. "\$3000 profits is four months." In Shook \$344 sales in one day Brain bought one outlit April 5 and 7 more by August 25. I wate, bought one outlit and 10 more with a year. Mrs. Lane of Pitchiorgh says "sold \$3000 packages in one day." J. R. Bert says "noly thing I over bought that equaled advertisement." John Culp mays. "Everything going townly. Crispetts to appear west? A all



WE START YOU IN BUSINESS

Furnish secret formulas, raw material and equipment. Little capital required; no experience predet.

Build A Business of Your Own

No hads to the mis of Crispetias. Everybody illust them. It's a decidous food reciseties. Write for feets about a business that will make you independ-ent. Start now, in your own town.

Profits \$1000 a Month Easily Possible Send routs, for illustrated book of facts, it contains so the single latters from others, shows their places of business, tells how and when to place, and as interesting are ded. From Write new!

LONG-EAKINS COMPANY 417 High Street Springfield, Ohio

Don't Envy The Plumber BE ONE!

611-00-510-00 PEN BAY and work EVERY day, in the

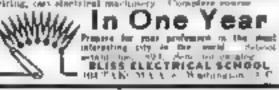
History shifted specimens and test per specimens to be used in it. White specimens and test in the Historian post of the Mark to Historian to be used as the sequent of the specimens of the spec

LEARN IN 8 to 12 WEEKS If you are making item than the area and him we do not be true of the first than the the first

UNIVERSAL PLUMBING SCHOOL



Engineering berinder the class while the class while the stand by related by related to the stand by related to the stand by related to the stand by related to the standard by related to the standard by the



Wrestling Book FREE



mentions ould detende and ful Ping Involue appropriate and property of the pro

Frank Gotch and Farmer Burns of or you a well-the date of all other Working to make peed opinity improved to have be small. Her make peed opinity in the large of the house her make before write they be the large of the house and before the house and before the house with make Arthrol like the deduction of the peed of the house which a peed of the large before the large peed of the large pe

Make More Money

Read the Money Making Opportunities on pages 116 to 143 of this lesse.

Conquerors of the North

(Continued from page 154)

the Arctic Ocean, one of the bleakest regions of the North, he gave Alaska something to talk about. When his team mushed up to the starting point in front of the Board of Trade Saloon at Nome, the sourdoughs rubbed their eyes and took a second look. The Norseman had "tlannel shirts" on his dogs! At least, that's what the miners dubbed the flannel protectors Seppala's dogs were about their waists.

"Those flangels protect the dogs against the short shore ice needles which jab and cut their low bellies," Seppain explained to me. "I also encase their feet in little mukluks as soon as they show right of tenderness. Old-timers laughed at me, but look at the record."

OF HIS records, indeed, the hardy Norseman may well be proud. For it was he who lifted from the head of A, A, (bestty) Allan the coveted erown, "king of the Arctic Trade." Three in agreession in 1915, '10, '17did Seppala, with Togo as his leader, win the all important, All-Alaska Sweepstakes. His most recent victory was the winning of the New England Sled Dog Dertry in January at Poland Spring,

The war and the rapidly diminishing population of the Nome region resulted in the suspension of the All-Alaska Sweepstaken after the 1917 race, to Seppala's desappointment, but there is talk now of reviving the sport at Pairbanks. If that happens, Seppula believes has Silierrans will set a new record for the 400-pile course.

For a man who wears the crown of Arctic trail king, I found the stardy little Norseman amazingly modest. Ask him to talk of the brave deeds he is known to have performed, and he will start teiling of the heroisin or funny stant of some other dog musier.

FORGET the serum run, and let me tell you about Eric Johnson and Charley Pagerstrom, two mushers in the 1 S. Mail Service up there," he said to me. "Eric and Clurley carrying the mail from Unalaklest to Nome one day back in 1901, had picked up two passengers women at some point on Goloon Bay, bound for Nome. They were trying to make Bluff for Christmas Eve.

"The trail took them about twelve miles over the Bering Sea, and they were about to leave the see to take a short cut overland when the ice cracked like a rannon, and began drifting away from the shore, seaward!

Eric, who was up near the leaders, had all he could do to halt the team before dogs, women and all went overboard But he did. An Eskimo on shore saw what had happened, went to the rescue m a cance, and would have rescued them without any trouble, only about a hundred feet from the ice floe his cause spring a had leak, and he had a close call reaching the we himself. In fact, he had to jump into the water and swim for it.

Eric and Charley fished him out in a harry, but they forst awed on page 1 th



No More Razor Blades To Buy!

Amening New Invention Guarantees You 345
Slick Shaves a Year — Makes Old
Blades Keener Than New 1

KRISS-KRUSS marks such a radical advance to be extended much more has a stropper. Hatter to be exited from more was a stropper Hatter to a super stropper a stude out of an old one twent literally t makes a new blade out of an old one twenty day and makes handreds of keen, quick share blacks through stropp your blade (any make) on the diagonal fact the manufact barber. Eight

the diagonal just like a master barber. Eight "lucky leather gracess" do the trick in it seconds. Automatic flat-flop article. Nickel in flim up to not for a marker plan appearance with the According to the Acc tristing might. And alors can take:

Unusual Offer

Right now—to introduce hillest KRORS stropper, I will give you as an priving new kind of theory without extra charge. Really 3 reasons in one. Instantly adjustable to any sharing position A flip of the finger makes at 1) T-shape. The taught old as the finger makes at 1) T-shape. The taught old as the or 2) the goal (new way) through old as the or 2) the goal (new way) through the I region to which a Minde of resides metal. Comes with 5 specim-pricess placing and in softrally unlike morthly you was unlike anything you ever

Get Details

The actouching offer is booted. Soud the conpen for its ugant on ob-ances ag k H 1 8 8 -kille 88 meet obs today They are end only the onch buthors the depresentatives for dicert from the futory and are even note temp by the rune 1 can tell to bere. Clip the couple teday for full details No obligation.

AGENTSI

Make is a recover in Killson his representation J. Kallson public representation of the control of the control

state of the state

REKRISS KROSS

RI DES MFC Cr.
Dept. D-M1, 1418 Pendleton Ave.
St Louis, Mo. Rhodes Mfg Company STROPPER

Please setal me without obtention, details of ERISS-EROSS strapper and Free caser offer

Address

State representatives



Only 28 years old and earning 15,000 a year

W T Casson left school at an early age to take a "job" in a shoe factory in Heatington, W Va., at \$12 a week,

All a week,

He worked bard and long and he had greater handlecapt than you will yet have. But he transed to
quit. He made up his must that he was group to
get ahead in a big way and nothing could swerve has,
from that resolve.

I also W. T. Carrona is awaste and manager of the
of the largest bartery service actions in West Vicginia with an accuse of \$5.5.00 a year

He g. m. at arrely for he are set to the interma tonal correspondence is books and mas he suit refers to the I. C. S. services.

to the I C is sent books. Just a recent to the I C is sent books. Just a recent to the I c is sent books. Just a recent to another the principles of belonge egant of a to depoint the the principles of belongy transition on a plant in electricity. That shows how theroughly be quarentamic has week.

If he I c S can anoth the way to succeed for men the W T Creson, it can belo gook. If it can belo principles are less than the point of the policy of the sent property.

an help you.

At least bird out by marking and mailing the cou-pon united below. It won't cost you is per or outgate you to any way to ask for full par ex, her that one simple by a set may be the means of Success, W T. Caroon w

Surely, W. T. Carson wouldn't be suralog \$15,000 a year today if he hadn't found out about the L. C. J. when he did.

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS Den 2830 E Beranten, Punes.

Without our or chitration, please and me a copy of Fraz lacking, Win With And Wity," and let me install plant the street to fore which I keep market X

PURINCUR TRAINING COURSES IN 0 COURSES

Jis branchists

Jis can be being

Jis can be being

Harden for torthering

A sub
A subA subA subA subA subA Numbers of Americans and Property of Americans of Security of Secu

TECHNICAL AND MOUSTRIAL COURSES Firstries: Engineering
Firstries: Engineering
Firstries: Engineer
Weshith at strange
Machine Shop Fraction
Rail and Pady and
Gan Engine Operating
Firstries and Mapping
Metallury | Mining
Man, Engineering | Santo

to the part of the

Massa			
Street Address			m
City			м
Decepation.			
II pou regula 14 Cap Romal Correspondence	erfa, soud dhiu e Medania Cons	tempore to the	falores.



Conquerors of the North

(Continued from page (35)

had no extra robes to wrap him in, and it looked as if he were doomed to freeze. Then Eric, who was a quick-thinking chap, says to Charley, 'Charley, there ain't nothing to do but wrap this native up in the robes and blankets with the womenfolk. He was trying to save us, now we got to save hom? The women were the right sort, so the two boys just wrapped the three of them together

"Meanwhile the ice was floating right. out to the sea. They had only a few dried salmon and some rolled oats, but it wasn't food that was bothering Charley and Eric right then. Their problem was to keep from freezing. That un't a hard job if you are mushing, but when you re on an ice floe it's different.

WELL, Br. those two boys just started jugging in a circle around the sted and the dogs. Hour after hour they kept at it, stoppe i g occasionally for a brief rest to see if the womentak and the native were all right. After a time they got pretty tred. But it was much or freeze so they mushed

Four days they were on the drifting ice flor and then the wind died down, new ice formed, and they were able to make their way over it back to land When the party reached bosonon, bacand Charley went to bed and slept thirty. hours, nonclosiv else taxing focus pasces on the mail sled.

The Maskan snows bade under their whole breasts many trageshes of the trad-The number of men who come to "the end of the trail " without the comforting hand of a woman or pal to ease the paner of passing is legion. Some disappear without trace, others have died beside the trail without apparent cause, the manner of their ending remaining among the unsolved mysteries of the North.

THERE was Father Ruppert, a gentie, lovable old l'adre, who gave up his life trying to carry joy to the F-kimo children at the orphanage at Hot. Springs one Christmas Eve," said Seppala, descussing these strange cases,

The Padre wasn't an expert musher, although he often made traps of considerable distance. He left with his sled stocked with love and fruit for the children. but never reached his destinataun. Two days later one of his dogs appeared at Hot Springs, and searching parties set out to find him searched for days along the usual trails, then speemd out and one of them found toe Padre a body close to Pilgren River, his fur cape under his load.

"One by one his dogs reappeared at different points, but his sled was never found. There were several theories as to what had happened, but, knowing the priest as I did, I'm convinced that owing to his failing evenglit he lost the trail, his dogs scented resideer and gave chase, and he was unsledded. Facing the storm and the might, be mushed until exhausted, then lay down to die. In his hands, folded on his breast, was a silver cruedix."

Father Ruppert was one of the thoroughbreds of the North!



GET THIS BARGAIN NOW! (A. tion tripe me philas; now finish and or process to proceed that adjusted. Find pass grant and an arrange to the process of the passes of the p FREE BOOK! The state of the last of the la the Bisperse Ward May Co., 1244 Proposed Bidg., Liv

The FURLYTNAM() is a remotes high class ignition distributing until to be used in place of the remotes timer us all first sure, trustee and tractions, liquit on an entirety different basis. I has away with all ruller for acts. No citing or attent in nevertage (first an instant punitive special. Test not miss as pay open.)

Users Say "It's Wonderful"
The most pleasing results are supposed to latery poto the from an infect too in, raying it to the poor manderful device put on a fined mr. In county assess

\$40 to \$120 a Week to Distributors? obtionary profits do not belong to this rises. Here to a proposit less had assumed the interest of story Ford owner to the larging post.

Be the First in Your Locality Of secret we must give prof-erate to the first person to med knowley on write today Special Offer to Coers from in Introductory Wifer for

Leigen Times Mig. Co., 1916 Marscholle , Midwenton, Wie,

Cleared Up soften in 24 hours. To prove you can be rid of proples, burkheads, acus graptions on the face or hody, has seen fich, eccerna entarged pares, oily or shiny skin, earlied seen they for hands and askingers often by root on which only \$1.50 people mediand reveal that at 12 people makes a closed make all asking on the first of the closed people which the first of the closed people will be seen to the first of the closed people with the first of the closed people will be seen to the closed people will be seen to the closed people with the closed people will be seen to the cl

E. S. GIYENS, 66 Chemical Belg., Kanasa City Mo.

STUDY AT HOME the state of the s

We wishe you may be done, I put their as been for the first their years of the large and the large and their their transfer of the standards o



Read the advertisements on Pages 116

to 143 this issue if you want to get ahead!





Mazoa

Occupation

DEAFNESS IS MISERY



Mill man of people leaves that, but Malticoles of pernorm with defective hearing and blead Notices are again. chipping provinging good Theater and should be cause they use Lennard by oble Aurospric Ear Drums which are Tiny Megaphines fitting in the Bar entire y our of sight. Seeming on batteres on head passe. They are Caseen Comform and tocaperplan.

- - - Felf in and make consent rates - - - - - - -

A. O. Leonard, Inc., Suite 604, 70 5th	Ave., I	NT
Please sens me without obligation your littled thousant about Deafness and Sworn		
To write his		

Nahoe	35164						
		Print or write name atalogs					

Here Are Correct Answers to Ouestions on Page 55

- 1. The famous Mount Wilson Observatory of the Carnegie Institution, which stands on the top of a mountain near Paindens, Califorms. With tremendous expense and difficulty an automobile road has been built from Pasadens to the mountain top, so that visitors can see the great telescopes, one of them the largest in the world.
- 2. Single diamonds are found occasionally in many parts of the United States, but the state that has produced most of them to date is the state of Arkansa.
- 3. Mariners make use of the magnetic compass to tell them the direction of north. But, es a matter of fact, the magnetic compans does not point luward true north, that is, toward the North Pole It points toward the North Magnetic Pole which is ocated in northern Canada, bearly 2,000 miles away from the true North Pole. Furthermore, when one draws close to the Magnetic Pole, the variations of the earth's magnetism become quite important. Explorers in the Arctic are not able to depend upon their magnetic companies, even to indicate the exact direction of the Magnetic Pole.
- 6. Perhaps the most notable gold mines of the Arters were those in the mountains near the modern town of Magdalens, in northwestern Mexico, post moth of the boundary of the I mited States.
- 5. When Columbus made his first landing in 1492, it was on one of the islands composing the present Hahama group, northeast of Cuba, believed to be Sun Sulvador.
- 4. With the exception of a few very rare metals, platterum is now the most valuable metal in the world, for more valuable than gold. It is important, therefore, that an American country, Colombia, contains large deposits of plainium and constitutes, ingether with Russia, the chief source of this metal.
- 7. Although this solution of the traffic problem has been suggested in many parts of the world. the only instance of its actual sais, so far as we know, is in the famount "rows" in the city of Chester England. On four of its main streets there are two-story sidewalks, of ancient construction.
- 8. The highest six temperature recorded anywhere under conditions that scientists are willing to accept an accurate was reported recently from the village of Asimeh, about twenty-five miles south of the city of Tripoli, in northern Africa. That record temperature is given by the National Geographic Society as 136.4 degrees Fahrenheit. It is probable however, that the most consistently hot region on carth is in the central Sudan, south and southwest of Egypt.
- 9. The oldest usines the history of wh. h in known with any assurance are those from which the ancient Egyptions mined turquouse and other precious grans on the penusuals of Sunai.
- (0. The word "monsoon" is used generally to designate the wind that brings the annual carry season in India, usually in the first bail
- 11. Probably in the Hawaiian Islands, a meeting-place for the aboriginal races of the Pacific. typined by the Hawman, for the yellow races from China and Japan, and for the whites. There are also tome negro elements in the pro-
- 12. On Oahu, an island 200 miles northeast of Hawaii.



I Can Teach You to Sing Like This!

I do *not* mean I can make a Caruso out of every man—or a Mary Garden out of every woman, - but l ean teach you in a few short months a basic secret of voice development which Caruse discovered only after years of persistent effort

HERE IS THE SECRET! This is a picture of the human throat, showing the ail important Hyo-Glossus muscle. Biographers of the great Caruso tell us of his

wonderful tongue control, Carsao bimself speaks of R in his own writings, as the basic secret of vocal power and beauty. But tongue control depends entirely on the development of your flyo-Giosaus muscle,

The Hyo-Glossus muscle is your throat can be strength-ened just so nurely an you can strengthen the muscles of your arm-by exercise.

Professor Eugene Feuchtinger, noted vocal scientist, famous in Europe before coming to America, was the first man to tsolate and toach a method of developing the Hyo-Glossia.

If you are ambitious to sing or speak, or merely improve your voice for social or business purposes, here is your opportunity. If you suffer from stummering, stattering or other vocal defect, here is a sound, scientific method of relief. Upder the guidance of Prof. Feuchtinger humself you can practice these wonderful allent exercises in the privacy of your own home. For "Physical Voice Culture" is ideally adapted to instruction by purfusionable to. by correspondence.

100% Improvement Gnaranteed

Thousands of men and written have already received the benefits of the "Perfect Voice" method. If you will practice faithfully, your entire satisfaction is guaranteed to fact, if your voice is not doubled in power and beauty, your money will be refunded. You alone are to be the judge.

Free Book Send today for new book "Physical Voice Cul-

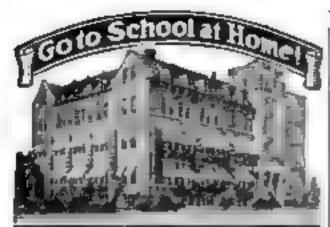
ture" It will open your eyes to the possibilities of your own voice. It will indeed be a ravelation to you. Get it without fail. Mail coupon now.

Perfect Voice Institute finds 13-54 Charge

PERFECT VOICE INSTITUTE 1922 Sameyade Ave., Studio 13-64 Chimge Flease eend me FREE your new book, "Physical Voice Culture" I have put X opposite the sub-ject that inverests me most. I assume no oblige-

O Property	() Symbol	D West Y-	C Studen
Home			
Address			

· president



HIGH SCHOOL COURSE IN TWO YEARS

YOU AND BADLY if you lack NANDICAPPED High School training.

You cannot attain business or social prominence. You are barred from a successful business career, from the leading professions, from well-paid civil service jobs, from teaching and college entrance. In fact, employers of practically all worth-while positions demand High School training. You can't hope to succeed in the face of this handicap. But you can remove it. Lot the American School help you.

BIG FUTURE This course, which has been prepared by some of America's leading professors, will broaden your mind, and make you know, alert and capable. It is complete, simplified and up-to-date. It covers all subjects given in a resident school and meets all requirements of a High School training. If the the first lesson to the last you tally examined and coached.

USE SPARETIME ONLY

Most people idle away fifty hours a week. Probably you do. Use only one-lifth of your wested hours for study and you can remove your present handscap within two years. You will enjoy the lessons and the knowledge you will gain will well repay the time spent in study.

Check and mail the coupon NOW for full particulars and Free Bulletin.

American School

But, H-175,
Propel Are, and 19th St., Calcula

American School

Dept 14-475 Drund Ava. & Sath St., Chicago Send me full information on the subject churked and how you will help me win success.

Beridang Contractor
Automobile Engineer
Automobile Repairmen
Civil Engineer
Brucharal Engineer
Brucharal Engineer
Cert Fabile Arrenation
Beakira par
Draftmen and Designee
Contract Engineer
Electric upht & Parene
Green Edscaren
Teathmal Quidana

Camput

Lawjut

Lawjut

Mechanical Regiment

Mechanical Regiment

Surpic ymeet Mane

Janua Engineer

Janua Engineer

January Engineer

January Engineer

Lichthouse Engineer

Lic

Cather

Address

New Wings for Your Voice

(Continued from page 41),

would encircle the earth twelve times. and there "talk-capacity his steadily heing increased. The multiplex system sends four messages at a time in each direction over a single wire. At the rate of fifty words a manute, this means that a single line has a capacity of 1900 memages a day, as compared with an average of 480 by band sending. Each message as it is received to printed automatically on a tape by a teletype machine. Electric typosts rapidly write uncappy messages, apparently from nowhere, their unseen fingers pressing the keys, shifting the exeruge, and spacing the lines.

THE sea, the air, and the land are teening with messages from man to man. Today two thirds of a milhon words each day flush by the sunken treasures of the Atlantic's deeps half as many more role the same route by air on man made radio lightning.

In the air regions closer to earth, aviators are now able to intercept and transmit electric-wave messages. They converse with brother pilots in the sky, and with their friends on the ground Stindar messages goide their course in night flying. For this a directive radio antenna has been devised by the 1. Starmy and Burray of Standards. As long as the pilot stays within the narrow lane of his course, he receives a continuous signal in Morse code, when he desintes, he receives either the letter 's or no which tells him toward which side he has defited.

Through the earth itself, waves of sound and electrody carry messages. Underground sound waves can be picked up by an instrument called the geophone, a form of increptione. During the war this device enabled beteners to detect enemy moining and suppong as far away as a buinteed feet. On one occasion Allied supports, working their tunnel to within aix feet of a party of therionic supports, listened to the talk and laughter of the enemy before exploding the mine. More recently the geophone has noted in mine rescue.

IN WATER, too, waves of communication travel. Suppose I suspend a submarine bell under my boat while you, from another boat a mile distant, listen through a hydrophone (a seagoing microphone) for the sound of the bell. In a little more than one second after I tap the bell you will bear the signal. This is about five times as fast as the sound waves would travel in air. You may even hear one of the "drupping fishes," with your hydrophone, fishermen have heard the sea robin and other fishes at a distance of a limited feet or more.

If our boats were out on the ocean, separated by fifty miles of ruling waves, you still could bear an explosion set off near my boat. If we both were equipped with phones, and were a hundred miles apart, each of us might hear an explosion two hundred miles away from us, and might even locate its position within a

half mile. This has been done. Again, if you should become lost in the fog. I could pick up the vibrations of your propeller. You in turn, could avoid recta by listening for submarine belis along the rocky coast.

Lightships and shore stations would give you regular signals, some of them utilizing the time difference between the speed of radio and sound waves to give you the exact mileage to the station. Should you approach the coast near Calais, France, you might use special equipment to pick up enormous waves of assaudille sound "sent out by a great logliora established there. Such sound vibrations are beyond the range of human each. And all thus time I could keep in louch with you by radio.

CO. IF you were in distress, your Treache would be far snopler than was that of the steamer Republic in the first wireless rescue at sen. You recall that the Boltss caught her CQD, the wireless distress signal of that time, that she was satking after a collount. For twelve anxious hours the Hallie searched the dense fog, constantly wirelessing, but was forced to cover more than 200 miles in a sig-sag and circling course within on area ten inder aquare, before she could work up to within a hundred feet of the Republic Even then the stricken vessel was investble, but finally the faint green tight of a flare was picked up, and the rescue effected. If the Republic had carried a submarine bell the resching ship rould have gone to her directly

the waves of modern communication safeguard the lanes of communication safeguard the lanes of communication before. Out on the Atlantic roam the respected boats, radiolog the presence of severgs, that no more Titanic disasters may occur. Great linear carry microphones to ratch the echoes of sound waves reflected by the floating ice mountains, much as the sea floor is mapped by the some depth finder. Some vessels also carry "thermopiles," delicate thermometers which measure waves of heat and cold. One such device measured the heat radiated from the finnel of a vessel seven index away! Weather reports, too, are

WHAT does the future hold? Crome waves, for recently a well-known pickpocket was identified two minutes after his photo was wired from Chicago to New York. Thief detectors now indicate the presence of singigled tools and metal objects.

The radio motion picture is close at band, and with it will come marvelous extension of education and home enter-tainment. Newspapers will one day print the entire important news of the world, with photographs, the same day it happens. Television apparatus in your home will depict the world of missir, the dance, opers, and sport

Devices nearing perfection render these propheses simple statements of developments to come within our own time.

How to Work Wonders With Your SUBCONSCIOUS MIND



Cine me just \$0 minutes and I'll united, the fleedyster of (that you had never of mornal prior your Subsensement Mind. Note the remodute offert on your business, areas. and everyday life.

BY GAVED Y. BUSH

4 vast reservoir of mental puergy. A hoge threehouse of he is purer. This either hale breakeness bland. Bon're got it. Your friends have it. Everyone has it, flui not one in a

throughly known to be a specific to the to a waken some in the managers of the above a contract to how to a waken some lighterappening Mail, how to deprive at the managers of petitember Chiego, hi if it nor da antifero, le garmone to brough

programme can and in other than minute there may be about The line same of our trains of the other man Moral [1, sell-lar what the Saher need of Moral at our love on reach a must have be resident to part between get the parent out of st an amophe on S. M. C.

ONLY SO CENTS Write leday for this amazing best of more time one limited pages. "Yundland of the Subcaustions Midd." Send only 50 cents in full payment. If you are put delighted, return. the book within 5 days and your money will be inetably nuferal at.

DAVID V. BUSH, Frolling 225 M. Michigen Blud., Dept. T-964.

Chienge, III

EXPERIENCE NOT NEGESSARI

na help wanted advertiments.

The and you never will Experience if never your first Experience if never post to the part of the a in the experience if never post to the part of the a in the expert post to the first of the a in the expert post to the first of the a in the expert post to the first of the expert post of the expert post of the expert post of the expert post of the expert in the first post of the expert of the Bare you ever seen this heading



Laffelle Extension University, Boot, 487-8 Chinego



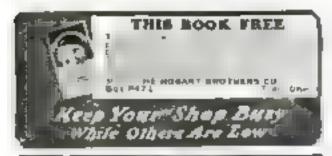
to work, I'll bet you \$50 that you can I work for an 10 days and earn less than \$100. Think I'm bluffing? Then answer this ad and show one up. Openings for managers, The "Wonder Box" sells on subt.

TOM WALKER DEPT. 25 - FITTERURGE, PA.

Forest Kangers

Men wanting Forest Ranger, Railway Mail Clerk, Special Agent, and other government positions, \$.500 to \$4500 a year, Write for free particulars and hat of positions,

MOKANE, Dept. 218, Denver, Colo.



\$25 IN PRIZES See Cash Prize Offer on Page 116

I Catch My Wild Beasts by the Tail!

(Continued from page 47)

diverted to the bulge in the snake's midsection. In that moment two of the great cods switched about my left leg!

"Hold it, Mangmeers, hold it!" I yelled, seeing the boys besitate.

The pressure on my leg was terrific, A little more, and the leg would break. I called to haputang to try to pry the tail loose. He made a brave effort, but his fingers weren't strong enough. Then the snake jerked me off my feet. I yelled for more boys. Finally three of them, digging and gouging with their fingers, managed to work the tail loose and to hold it. Two more boys joined in the tug, and little by little the five unwound the make. From that day I have had a healthy respect for the constricting power of the python.

SOME of the most strenuous sport I ever engaged in came diring an expedition from Tara down into the valley of the Zamiesi river after wort lugs, lightest of not materials. On this trip I had with me some twenty-five Congo and Barotse native carriers, and seven hunt og dogs. As my object was to capture, and not to shoot wart luigs, our method of hinding was quite different. from that employed when out to k h.

I was to one goes hunting alone or at best with only one hos, but I had at least fifteen. We bunted in a long line. First cause inv. two keepest Gango trackers armed with assegnin or spears, and earrying short lengths of mwhide with slip moses on the ends. I followed with a rifle and raw ode. then came, in order two gun bearers, the dog boys, each with two dogs, a boy with water logs, a boy with an axe, and the rest carrying extra rawhide, incos, cameras and food

It was tremendous sport, yet one of many pends. The wild bours are great fighters, and elever 1 in. Since the order carr bush does not give them an even chance to fight, they abused invariation head for some ant bear hole they know of and slide into this backward. Its ling thos, they make for a thick thorn acrab and back against a free.

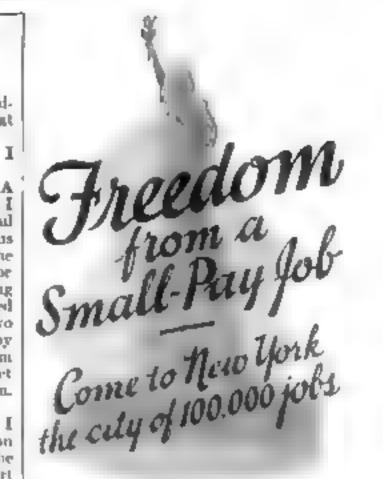
Never will I forget the cluse one fine boar gave us, while the tropical sun beat down at a temperature of 110 degrees.

This fellow new us just as we came to one end of a clearing where he was feeding. Instantly be made off, and we tore after him. He raced for an ant bear hole. and I caught a feeting glimpse of him as he slid into it backward in a cloud of dust.

AS WE surrounded the hole, panting and curring, unddenly the boar burst out in a volcano of dirt.

"Run, run!" yelled Towl, leaping backward. Mangineera poised his spear,

but I shricked and stopped him. For the moment, flight was the better part of value, so off we went, whose the rushing boar tossed two dogs with side sweeps of his pazorlike tusks. Within half a muc ise found another ant bear hole. this time large enough to protect him, But we had good dogs. Three of them disappeared down the hole. Subterrances (Continued on page 140 rumblings and



ANY MAN who can read and were med use a pair of pliers can become an electrical expert and free himself forever from the long hours and drudgery of a small pay you.

And we are the RIG PAY profession of electric ay right in New York City is the heart of the electrons would—the ary of 100 000 p for Al the same time you not serior if the AIG PAY profession you can be enjoying the aights and wonders of New York, the modern Bagdad.

Be an Electrical Expert

Graduates of the NEW YORK ELEC-TRICAL SCHOOL are in demand by all the but electronal companies. Or, if you prefer the independence of a business of your own, there are thousands of opportunation for efficient, dependable men to become electrical contractors you are your own besse the money you can make is little to only by your tests chergy and ability

Personal Instruction

The NEW YORK ELECTRICAL SCHOOL is not a regrespondence schools You serve by doing or personal matricetion on full sue standard electrical equipment under the personal supervision of I rashed that ructors

At N. Y. E. S. you train your hands and mind at the same tane. You learn the themses of electricity and then you are shown how to put the themses at actual practice by solving the problems with your own hands.

the recent was a parter of a new posterior was the rear as a k quiter at a remails are but at the set of the analytic fact of the set of the analytic fact of the set of th

The NEW YORK ELECTRICAL SCHOOL 40 W. 17th Street, New York

PROFESSION MAIL TODAY COMMISSION OF

THE NEW YORK ELECTRICAL SCHOOL W. Louis Street, New York

Please send me PRREsour 48-uage booked I a complete and limit has request puts not under the Parent of the contract of the con

Address.

Are You Afraid to Face the Truth AboutYourself?

of every man when he realises how minerally he had for terform religion and when he is a second of high and when he is treamed for himself org once force the trick. dies minething accine a nt le man fince an est se for his callury, and down not: What are new answers a you sak yourself questions like

Am I not drifting along almissely?

What, after all, is my purpose in ther

Am I trusting ten much to chance to being me pushes?

What is my greatest weak puint?

In it look of Will, prove memory, mental lesiness, mind-was-dering, w what?

Am I "licked" by life, am I n "quatter"?

What can I do, now, "And ergoolt"?



How 550,000 People Have "Found" Themselves Through Pelmanism

Full matiliars is a science the system of mind-training is in how the distinct in the particular in particular in the extension of particular interpolities there are the their terminal and extension of the exte

What It Has Done

Februariem originated in firms firstain. Members of the 1953 (apoll) benting statummen, distinguished with lary and har as officers, world-income nucleus, artists, artists artists artists artists are relitary and published the income nucleus, and finance percels of he highest distinction in the major because but as emphysical primarities as either and lightness and distinction in the major because by her he has seen a because the arms the name of the major and finances in the major and finances in the seed to be seen a because of the seed to be seen and the seed of the seed o

Send for Free Book

When imple the Central Sir Rabert Rades Presell, Judge For D. Archers, Freich F. Walteb, Maker Greenenk D. I. referich Manting, Admired Land Baraches, Alastric Manting, Admired Land Baraches, I P. D'Channe M. M. M. Pringle Charles I have deviced and the color deviced and the Archert Sir Colors of Lander and the Canada of others equal? Carposts for that here a received the grant Pelmanians. This pick affects in ignoral to peak likelies for your Mey with the glast to paged your without charge a book likelies for your life to paged your without charge a best reported. Notes: He will be for foreign the complete agery of Pelmanians what to a stall what to deep of a filter of the poster of Sheine at the Lander Complete agery of Pelmanians of Sheine at the Lander Complete agery of Pelmanians of Sheine at the Lander Complete and the Lander Complete additional Complete addition. The peak has been during devices on the land interpartment.

The Pelman Institute of America

(Approved as a Correspondence Setsol under the house of the State of New Yorks

Suite 874, 19 W. 44th St., New York, N. Y.

The Pelman Institute of America, 18 W. 44th St., Suite 874, New York City

I want you to show me what Polmanton has attendity done for our haif a million people. Please word me much free bank. Scientific Minch Prayatop. This places we under po abligation whatever

Nume

Chty

Address

I Catch My Wild Beasts by the Tail!

(Continued from page 1 19)

yelps rolled up out of the dirt, then out burst the hog, scattering us in all directions. One of the dogs was impaled on a tusk, but the hog shook it off and dusppeared in a mass of thorns.

There the dogs cornered him. When we arrived on the scene, breathless and torn by thorns, we saw the boar backed against a tree, with a circle of dogs snarling and mapping at him.

THREE of you boys sneak around belund," I directed, "I'll go up in front and get his attention. While he's watching me you grab one of his hind legs and roll him over."

Catching night of me, the wart hog, disregarding the dogs, charged straight at me. Thinking that one of my boys would grab a leg. I let him come.

And he came! I jumped just in time. The bog almost gored me. Straight up in the air I went, the hog rushing under my undespread legs. As I came down I performed a fest any contortionist might be proud of. Bending double, I caught one hand leg of the heast, and with a jerk threw him on his back.

terab him! I shouted above the dinof squeaks and yells. "Hold his headthe up has shoul. Now his legs!"

In a moute the boar was our prisoner. He proved to be about three years old, with tusks projecting five inches.

Animal catchers at least have plenty of variety in their lives. If we're not after such easy things as pythons, or having fun channg wart hops, we try bagging something bigger-elephants, for example.

The capture of Yank, a besier elephant about ax years old was a typical example. Harry and Mackie Walker and I had been trading a certain herd of elephants near Choma for several months. We had managed to bag two-s "tony" haby still drinking milk and yet to cut its teeth, and a bull standing about four feet and a ball high.

The third time we got up to the herd we found them feeding. From the top of an aut hill we looked them over for a good calf. Yank, lying beside her hoge mother, looked about right.

HARRY fired, but failed to kill the enw, which rushed off with the rest of the herd. The pack of dogs, some fifty of them, took after Yank, however, and cut her out from the rest. Then, while the dogs were fighting with Yank, and we and our natives were yelling encouragement from our vantage points on ant lulis and in trees, the big cow suddenly returned. She had come back in response to the calf's trumpelings of rage and fear.

The old cow made straight for a bunch of natives atop an aut hill, where stood the aged Schamisas, an elephant hunter of long experience. We could see him motioning the boys to stand their ground. Then the cow charged, earn out, trunk dangling wickedly, tusks sloping dirty whote in the sunlight. Quick as a flash, behamisas let fly his long elephant spear. It strick home between the elephant's shoulder and neck, the razor blade sinking deep. The row backed away, acreaming, as if she had been but with both barrels from a .600 express rifle.

MEANWHILE, Yank was proving too big for the dogs. They couldn't play her out. And no man dured chance a run on the ground, for the calf was breaking trees ten mehet thick like so many matcheticks. Finally the

escaped and disappeared.

Several times after this we got up to the berd, but each time hank was missring. And when at last we did find her, she was very weak and thun. She must have been wandering alone for days. Again we cut her from the herd, but this time she did not stop to fight. Instead, she struck of through the bush, with white men, natives and dogs in hot pursuit Reacking the Choma river, she swam across, and on the opposite bank turned to fight.

All afternoon, in the intense heat, she fought the dogs off. But toward evening she began to tire. She drew water from her stomach and sprayed it over her head. After another nour of fighting, this gave out and she stood throwing sand and

dirt over her head and back.

WNALLY one native, braver than the Fee-t, got her by the tail. Yank whired, but the native lung on desperately. Then she charged off, dragging him for some hundreds of yards, until he was forced to let go. Mackie was the next to take a chance with the tail, He clung grimly. Harry and I, sliding to the ground, motioned the boys to come on. They came in a mob, and a moment later Yank was bursed in a sweating, grabbing, tying crowd of whooping blacks,

Three days after Yank's capture, the allowed us to ride her. She fed quietly and behaved respectably. An elephant is much too intelligent to fight after it once understands that it cannot win, and after it sees that it will be treated kindly if it

obeya ordera.

Life Chemically Imitated

MAN'S nearest approach to artificial creation of life has been reported by a French chemut, M. Herrera, of Paris. He created chemical droplets which behaved outwardly exactly like the single-celled amorba, lowest of animal forms. They moved from place to place, formed vacuoles within themselves, and divided, for all the world like unrellular, living creatures.

The droplets were produced by dissolving fourteen parts of caustic soda (lye) and one part rhodamine (a brilliant red dye) in 100 parts of water, and adding a few drops of this to a second solution of one part olive oil to two of gasoline.

The French savant explains that the resulting action, while of great interest, has no actual connection with life, which still defies the science of chemistry to create it. His own phenomena, he said, are due to physical and chemical causes.



-THE CONTROL OF BUSINESS

Accountants command the Income, Thomsandeneded About 9 to Cor-thed Public Accountants in U.S. Many sarn \$5,483 to \$25,000. We their yes thereby at hims in year apare time for C. F. A. susmine their or executive accounting positions. I revious bookkeeping knowledge upnecessory—

op Our training to support the by Wm B Casterbola, & M., C P A, assisted by staff of C A a Low rest C.P. A., assisted by staff of C.P. A. a. Low cost many terms. Write new for valuable 64 pers book from سنا سند

This Book FREE

in How to

DMMY DeFOREST COM has Developed Champions by Had

has Developed Character by Mad In Albert with a superior to the superior by Park In Albert with the superior by Albert with the superior by Albert with the superior with the superior with the superior with a superior with the su



Its Cause and fire ** Yell then be quit by reared year state a fined 10 cepte rear or states for John page of the twood book on Manufacture and Montal regress to tell soon I state manufacture as and other to see a state of the sound state of th

SIGNS and SHOW CARD PAINTING: MADE EASY



CHS F JUILS

\$25 IN PRIZES SEE CASH PRIZE OFFER ON PAGE 116

Answers to the Sam Loyd Tests on Page 64

The Matrimonial Dalsy Gome

The second player should win, and the secret is to keep the petals divided into two similar groups for your opposest to act upon. Then, as he removes the hast petal of his group, you do the same to yours, leaving him stumped In reply to your opposest a removal of petal-No. 1 for his opening play, you draw 7 and 8. leaving the petals in exact belves. Had her opening play been 1 and 2, then your reply would be removal of No. 8. You then contimue by imitating his play. If he draws two petals from the left side, you draw the corresponding two from the right. If he draws a single from the right, your answer is the corresponding single from the left, and so on.

Fifteen manutes in fair time to solve this.

Johnny's Multiplication Example

The thirteen musing figures may be restored by using 70 or 96 in multiplying the given \$13. You've a good head for figures if you did this in thicken minutes

The Ant's Bomily

Words ending with "aut" are inserted in the following order: Plant, tolerant, great, galant, brillent, prelent, flippent, dormant, verdant, abundant, can't, grapt, want, attendant, adamant, hydrant. A time of twelve minutes indicates a good vocabulary

Fencing the Tract of Land

Each son's tract is composed of three sociles. aquares, so we multiply three by four to learn that twelve of those little squares constitute the area of the lag ranch. The distance around the ranch is assess times the length of one aide of the unit square, and the partitioning fence is composed of eight lengths correaponding to a side of the unit square. There foce, the length of fewong required to surround and subgroude the much in come to 44 times the length of one side of the unit square

Calling the side of the unit square x miles, from the terms of the problem we deduce the equation: 1 for a junted equals \$45; if equals \$

This gives an area of four square miles to the nost aquare, of which there are twelve—a total of forty-eight square miles in the original rapels, which corresponds to the name of knear miles of febring

Fifteen master to colve this is good

Soubby McCann's Baseball Nine

The youngest member of Soulds, are also must have been 15 years of age, the oldest, 17 years So, number 7 in the group must have been the 16-year-old Soubby. If you picked him in eight minutes, you enroed a good rating.

The Clock Puzzle

Starting at noon, the hands will first be an line at 12 hr. 52 mm. 43 and 7 11 mc.

The manute hand now game 00 man, before the hands are again in straight line. The manute hand game 11/19 min, every minute, so we divide 40 by 11/12 to learn that in 1 hr. 5 mm. 47 and 3 11 sec. the straight line position of the bands will again occur, at 1 hr. 38 mm. 10 and 10 11 sec.

The next time will be 2 hr 43 min. 38 and \$ 11 acc. Then in succession the bands will be in straight line at 3 br 49 mm. 5 and 5 [1] sec.: 4 hr. 54 mm. 32 and 8 11 sec.: 6 o clock. 7 hr. 5 mm. 27 and 5 11 sec.: 8 hr. 10 mm 54 and 6'11 sec., 9 hr. 18 mm. 21 and 9 11 sec.; 10 hr. 21 mm. 49 and 1 11 sec.; 11 hr. 27 m.m. 16 and 4. 11 sec.

Those are all the tunes the two hands of a perfect timepiece will form a straight line across the dial, the only one to check with the second hand in the aketch is 10 o'clock, 21 minutes and 40 and 1/11 accords.

Fifteen esinutes to work that out meterilent



while learning That's what Wittenberg did-and now as a COOKE"Trained man he is earning Over \$600000 a year in

herer have such opportunition existed before. Money! position! influence! success! the Electrical industry offers you ALL this In what other profession could you go out of an evening and earn \$10 while learning?-make \$500 during a season a nd i maments" | knock out | \$2 : to \$30 a. week doing spare time jobs? Yes, these things ARE being done. Hunoreds of "Cooke" trained men are ilong then!

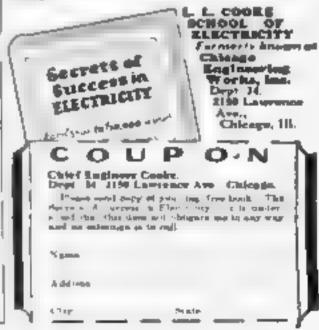
The "COOKE" Way to Blg Pay Rasy-Proctical-Surv

Previous experience not necessary. A half bour a the a death, we trig larger is by the arrive field to a 1 Al N a sheet and a de l'het Method of Their agrees to say or make you an expert the for a shown a necessary to de and a que at up they have the a gent free have ny 15, ng to begy

the course make good money while you learn. The Cost above you have t get end a time work he will demonstrate the said to will demonstrate the said of to be made being you who carried that a mining to be only fire a bit of the form of the state of

Valuable Book FREE-Send for It

Send now in the but in teres on 54-page. Hasterful to at that Charf I of over C man have properly for more and Supreman property of the free t transit is a fine community to prove the first t transit is an interest of the community (reduction





The only man who could talk to the Superintendent

"SOON after I began studying," a student wrote to us the other day, "we had a change in management at our plant. I certa nie was gloo then that I had decided to atudy in my spure time. For, thanks to my I C. S. course, I was the only man in the organization who could talk to the Super ntendent in his own language. As a cessis, I was promoted over men who had been here from ten to twenty years. My salary has been increased 90 per cent in the last ten months."

THAT'S a true story of what just one 1 C 5 plant has done. There are thousands of others. Every must brough tetters from mers and women telling of promotouts and increases in emery due directly to space-time souty

One hour a day, spent with the J. C. S. In the notet of your own home, will prepare you far ancerna in he work you also best. Tet, it will? Fut it up to us to prove it.

Mail this Conpon Taiday

INTERNATIONAL CORNERPONDENCE SCHOOLS See 7070 C Berutten. Punte.

Without son, or still a few, picking both one a repri of pour backets. "Who Winn and Wity" and full particulars both the source brise which 5 have decided &

GUENERS TRAINING COURSES Resistant Management industrial Maragement of the Management of th Tarife Management and approximation and the same and the

Asternantip

/**Picking

| Better Letters

| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Letters
| Street Lette

Selectionship (etc.)

TECHNICAL AND INDUSTRIAL COUNTRY TECHNICAL AND PROControl of Larla or
First to Larla or
Me hanten Engineer
Me hanten Profession
Machine Shou Prostate
Ra sea Profession
Face Engine Operating
1 viz first near
Auranying and Marping
Matallurar (Mining
Broam Engineering) Radio

Arabi ort.
Arabitort ort.
Arabitort.
Arabito

Street Addrson.

Committée.

Chie

I. you reside in County, send this reason to the interes-



DRAW CARTONS TURN YOUR TALENT INTO MONEY

Cartesquesa each from \$50 to \$500 per week some even more. Remarkable new Circle System. of Drawing teaches you in half the usual total. Bend for hookert and emple lesson plate explaining fact details of the Course.

THE NATIONAL SCHOOL OF CARTOONING Cleveland, Ohio. 615 Penton Building

When Your Wife Drives

(Continued from page 65)

antee that he can teach anybody else. It a much better to get somebody who has made a study of teaching auto driving to give you regular lessons."

"There!" exclaimed Mrs. Barnes trum-phantly. "That's just the trouble. Dick. You never were cut out to be a teacher,

that's certain

Well, you may be right, at that," admitted Barnes. "Whom can I get to teach her, anyhow? Can you do to

Nothing doing!" said Gus empliatically "I m a mechanic not a teacher I can suggest someone, but first I'd like to point out a few ideas that may help you

believe me, we'll be grateful, ' and Barnes. "A few more days like this and we d have ended in the divorce court.

To begin with I said Gus, addressing Mrs. Harnes, "make sure that your draying position is right. I told you about a custoon to put you near enough to the pedals. And you ought to have clips put on the pedals to keep your feet from stating off. Your pedals seem to be narrower than on most makes. Back away from the other car, now, so I can see if the steering gear as damaged."

MRS. BARNES started the motor and threw in the reverse genr. Gun watched carefully and noted that the clutch grabbed badly, although the pedal

was let in with great care.

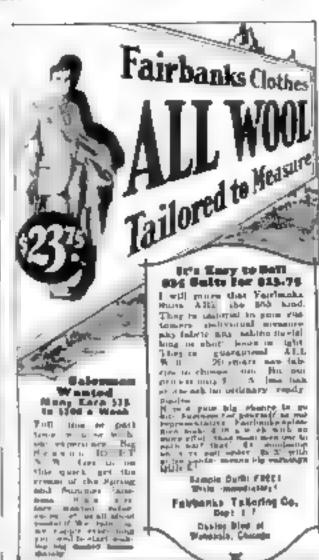
"That clutch needs touching up." be said. "It takes hold too rough, and a rough clutch is a strain on a new driver-The steering gear doesn't work any too easily either, and both the brake and clutch pedals seem to had badly. Easy controls help a man driver, but they are an absolute necessity for a woman, unless she is a regular Amazon.

"Most women, of course, aren't so strong as used. Learning how to drive a car is hard on both the muscles and the nerves, especially the perves; and a woman, being kind of high strung, gets to the point of nervous exhaustion pretty quielc. Accidents happen when drivers get bred, so you want to watch out that you don't keep at it too long, at first.

TERE'S another point. A woman I driver mustint expect that just because the sin woman, men drivers are going to give her the right-of way on all OCCUPATION.

Most men give a woman the right-of way when they meet her on foot but they re not so polite when they're driving a car. The rules of the road apply to all drivers whether they wear pants or aktris. and the woman who doesn't realize that is likely to find herself in a smash-up.

"Here's another thing that will help anybests man or woman- to learn how to drive. Master one thing at a time. Learn how to steer and get the rules of the road fixed in your mind so you turn the wheel the right was without having to think about it. Learn how to apply the brakes next. It's a whole lot more important to know how to stop a car than it is to start it. After that you can practice gear shifting, and when you get that far Continued on page 115





After put dat the four pasy medians are play easy made possible. He gravitum repaired blood p-cases decreased

Bong if pay don hundless and I can assemble it in a configuration to the part of the part

Green Cathor Could be to the country of the country

COLUMN THE PARTY OF THE PARTY COUNTY OF THE PARTY OF THE FIRST HARMAIAN CONTERVATION of OMERC. Inc. top. Proof Washington Daily Goods, L. 4. Here York, E. V., Agreemed at a grant Medical Parks the Laste of the Medical Parks the Laste

AGENTS 500% PROFIT GENUINE GOLD LEAF LETTERS.

Contracted to never tarmish. Abjoute can put them on steres and office windows. Knowing demand to get in the Paul Clark mays smallest do \$28.70. H. L. Reel made \$5.00. The house \$5.00. The same of t parentle and beral ofter to perecul agentia.

INSTALLIC LETTER CO., 414 H. Curt Street, Chings



DETECTIVES!

We train you to be a real detective. The CON-N R's costem of Lectures on THE SCIENCE OF CRIME IN ITCII IN training ou to deadered nervare upon at we good emphase you to erinina and rivil investigations is five to the weeks. Write for full information to Training Dogs. 46A. CONNORS DETECTIVE AGENCY, New Haven, Firms in Bent of elibertung, week as,

A 2c Stamp

-will start you on the road to success. See Money Making Opportunities on pages 116 to 143.

When Your Wife Drives

(Continued from page 133)

you'll realize how important it is to get steering so pat that it is instinctive. While your brain is occupied with figuring out the right way to go through the motions of gear shifting, the steering has to go on just the same.

Learning how to back up is a point that many otherwise good drivers neglect. Whoever is teaching you how to drive ought to take you out on a road where there isn't any traffic, to teach the gear shifting; and don't kick if he makes you back up a whole lot. Practice is the only

way you can get to know how to handle

the steering wheel when the car is going

backward.

MOST women don't want to know anything about what goes on underneath the hood or the floor boards, but you ought at least to learn how to change a tire without help. And you should know enough about the oiling system to tell whether the motor needs oil or not. Also, you ought to know how to read the gasoline gage and the radiator thermometer."

Joe Clark, who had been busy with another customer, strolled over at that

"Here comes a teacher for you," smiled Gus. "Joe is a swell teacher even if be does clash gears once in a while!"

First Beauty Parlor

Configured from poor 501

ences direction and velocity of the winds in the different parts of the cyclone at the earth's surface. By bringing about the convergence of winds, this current determines largely the distribution of precipitation in the cyclone and causes its center to move toward the greatest precipitation.

The book is filled with maps and tables that bespeak infinite capacity for taking pains, so essential in the work of the writer, who is senior meteorologist of the

U. S. Weather Bureau.

"The Anatomy of Science"

By Gilbert Newton Lewis Yale University Press

EVERYBODY who has a dog, talks to him. Some confide their secrets, some simply say "Go lie down." It may surprise them to know that to this scientist, at least, it seems hardly likely that the man can talk to the dog any more effectively than the dog talks to the man.

"Of the various desires that I might wish to communicate to my dog, he can understand about half a dozen," he says, "and can make me understand about the

same number of his own."

In fact, he doubts whether, judged by any objective criterion, the intelligence of man is supreme. Our Cro-Magnon ancestors were not comparatively so simple after all, he says. If we defined intelligence as ability to meet successfully situations of an entirely new character, he thinks, it is generally conceded that modern man is no more intelligent than the Cro-Magnons.





Give upe if under 16 peurs.

WASHINGTON SCHOOL OF CARTOONING Boom 264-E 1113-15th St., H. W., WASHINGTON D. C.



TRAVEL-SEE YOUR COUNTRY

Common Education Sufficient MEN-BOYS 10 UP

Sample 50e



LEARN PHOTO-ENGRAVINGS

Largus to \$500 monthly. Photography and Photo-La-graving tenght in largest entire of its kind. Established 1823. his demand for senduares. Write for free book. Intends College of Photography, But M7-A, Effeguez, III.

LEARN PHOTOGRAPHY!

Uses up to \$500 monthly. Or start your own business. Photographs and Photo-Engraving taught by largest college of its kind in world. Latablehod 1802. htg detel for creditation. We'th for free book. I Blacks Gollege of Photography, Sot 147, Effingham, III,



PASTERLITE MFG. CO.

14

17

19

20

38

25

20

20

33

34

36

48

48

50

31

59

55

56

64

65

66

69

76

CONTENTS

of This Issue

Editorial Then and Now..... A Job for One in a Million

By Captain Dingle

The Truth about Poison Liquor. . .

Conquerors of the North......

Glean Curtiss, Air Pilot No. 1....

By Frank Parker Stockbridge Electric Hands Prevent Wrecks . . .

Men Who Blast for Liquid Gold.

Now-Traffic Rules for Aircraft.

Maryels of Modern Scaffolding ...

What Does Your Garage Cost You?

Shall We Scrap the Yardstick?

The Strangest Art in the World. . .

New Wings for Your Voice

Hints for Radio Beginners

How Broadcasting Is Improving ... By George Lee Dawd, Jr. Don't Blame Your Radio Set!.....

I Catch My Wild Beasis by the

By Wynaut Davis Hubbard

Catching Up with Science......

The First Beauty Parlor

Huge Desert Ship

A Bost That Couldn't Sink-It

Parachute Jumper Misses Death

School Opens Butcher Course to Women

Miniature Golf Course for Businesa

Here and There with the Inventors

He Whittles Chains from Toothpicks.....

Last Word in Aerial Railway Luxury

Rides Off Cliff, Parachute Fails to

Remarkable Kite Built to Carry a

Sixteen Ways to Lighten Home Tasks.... Sam Loyd Offers Six New Tests of

Your Wits.

When Your Wife Learns to Drive . .

Practical New Aids to Motorists.,

The Home Workshop.....

Better Shop Methods.....

By Martin Bunn

Men

Bails Itself

by Inches

By Thomas M. Johnson

By Frederic Damrau, M.D. Amazing New Engines of War

By H. A. Brung

By Jack O'Donnell

By L. U. Reavis

By H. C. Davis

By Jesso F. Geldern

By Oreille II. Kneen

By John R. McMahon

By Alden P. Armagnac

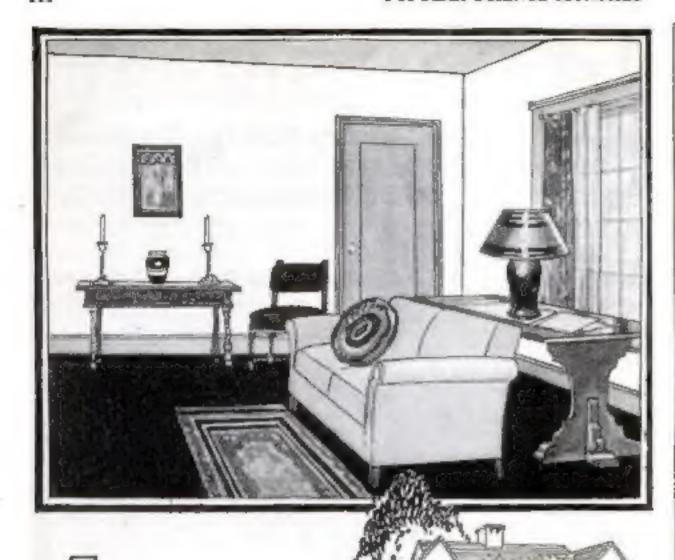
Bare Hands

By Hawthorne Daniel

By Robert E. Martin

By Alfred P. Lane

Tishy.



Get the time-tested gypsum wallboard

Because it gives you svery quality you want in wallboard. Because it is a standard building material, used everywhere, and always with great antisfaction.

FIREPROOF . INSULATING . VERMINPROOF TESTED BY TIME · ROCK-STRONG · EASY TO SAW, NAIL AND ERECT - NON-WARPING - PERMANENT

The exclusive USG reinforced joint system provides emooth, flat Sheetrock surfaces that take any decoration wallpaper, or Textone, the plastic paint for tone and texture.

Yet Sheetrock costs no more. Your local dealer sells it. Look for the USG Sheetrock label on every sheetmade only by the United States Gypsum Company.

> Sheetrock is inspected and approved as an effective barrier to fire by the Underwriters' Laboratories, Inc.

UNITED STATES CYPSUM COMPANY General Officer: Dept. 48, 205 West Mouroe Street, Chicago, Illinois

Reg. U. S. Pat. Off.

FIREPROOF ... INSULATING

Made by the United States Gypnen Company



UNITED STATES GYPSUM COMPANY Dept. 48, 305 West Mouroe Street, Chicago, Illinois Send me free booklet, "Sheerrock Walls."

And More Than Two Hundred Other Articles and Pictures Address This seal on a radio, tool or all burner advertisement signifies the approval of the INSTITUTE OF STANDARDS. See page 5. A. A. Sterman Late & Association Conference



You have a dozen uses for this drill

Every time you have a job to do that requires drilling this Millers Falls Electric Drill should be in your hands. Quickly, easily, accurately, in the time you used to take to get ready, the hard part of your work is done.

Automobile repairs, radio construction, electrical fixture work, drilling in tile (for bathroom fixtures, for instance), working on metal doors and window frames, these and many other jobs are all made to order for this drill.

Hardware dealers selling Millers Falls Tools will be glad to demonstrate the Millers Falls Electric Drill. Try it out. See how easily it handles, how strong and light it is. Years of making hand and breast drills have taught us how to design and build drilling tools. Years of service have been built into this new Electric Drill.

Specifications: Portable Electric Drill No. 414

MOTOR, Universal—operates on D. C., or on A. C., up to 60 cycles · SPEED, No load 1800 S. P. M. 1.2 Amps · CAPACITY, o-M in. in steel, o-M in. in steel, o-M in. in steel, o-M in. in steel, o-M in. in steel for 150 or 220 volts · Jacobs beavy duty chuck · Heat treated alloy steel gears · Ball thrust bearing on spindle · Armature mounted on high grade ball bearings · Automatic switch mounted on handle · Armored attachment plug · Aluminum

bousing efficiently ventilated . Pig-tail brushes (not namelly found in drills of this size). Easily replaced from outside without taking tool apart. Greats lubrication throughout. Sfeet best quality rubber covered cord furnished. Spindle offset for close boring—% in. from outside of bouring. Weight 54 lbs. not. Overall length 12 in. Packed one in a heavy corrugated box. PRICE. 120 Volts, \$30.00.

MILLERS FALLS TOOLS

MILLERS FALLS COMPANY NEW YORK, 26 WARREN STREET

MILLERS FALLS

MILLERS FALLS, MASS.

CHICAGO, 9 SOUTH CLINTON STREET

